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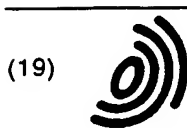
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(54) **Method and apparatus for finding and selecting a desired data item from a large schedul of data items using a TV set and a controller similar to a TV-remote-control**

(57) An apparatus and method for presenting a viewer with an overall representation of the present number of entertainment programs available for selection given one week of program schedule data for 300 or more channels and one or more filtering criteria to limit the number of items represented in the overall representation. Sequentially applied filters will filter the group of program schedule data items that has at least 100,000 half hour time slots offered by 300 channels each week into a smaller subgroup where individual

consideration of each item of the subgroup can be made in a reasonable time. A set top box drives the display of overall representations or results of filtering criteria on a commercial TV set. Once a reasonable sized subgroup is obtained, other displays provide specific information of the program offerings of the subgroup. Selection of the filtering criteria and selection from within a subgroup is interactively made by a viewer through the use of a controller that looks and operates very much like a TV remote control. This makes the interaction familiar, easy and predictable.

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**D r i p t i n****Techni al Fi ld**

5 The invention concerns a method and apparatus for subjecting a large schedule of data items having multiple attributes to consecutive selection criteria in order to reduce the number of individual programs to a manageable group which can be visually searched for a desired data item having a selected subset of the attributes, and more particularly to an apparatus and method which use an interactive control having directional buttons and a select button that are used in conjunction with an interactive display viewed on a normal television set to select the desired data item.

**Description of the Prior Art**

15 Presently there are known methods for reducing a large quantity of data into a manageable set of data which can be visually searched for a desired item by a decision maker. One example of such a large quantity of data is a directory of a fixed drive of a computer system. Methods implemented through interactive graphical user interfaces for personal computers and workstations display and reduce disk drive directories to root directory displays which typically show root level files and one or more branch subdirectories for the user's selection. Upon selection of a subdirectory, usually by a mouse, the display typically shifts showing files of the selected subdirectory and sub-subdirectories for further selection. The subdirectory display is often too big to fit on the screen, so interactive scroll bars are typically provided so the display may be controlled by a mouse. Using the mouse and the scroll bars, a user may work down the directory tree structure until the desired file is found. Such graphical user interfaces are common for computers and monitors where visual definition is typically at least 640 x 480 pixels for each display. Such techniques might be used in homes to access databases of useful information, such as airline schedules, television programming schedules and movie-on-demand catalogues. Unfortunately, each home does not have a computer or work station with 640x480 pixel definition which could take advantage of such existing databases. Further, the NTSC television set which almost every home has in its living room has relatively low viewing definition compared to 640 x 480 pixels or more per screen definition of computer monitors. Moreover, the typical home television set is not connected to a mouse, which is not an appropriate pointing device for the living room, rather most television sets have controls on control panels and/or on a remote controls. If just a fraction of these home television sets were used to find and select airline ticket reservations, programs to watch on 300 hundred or more channel cable television services, or pay-per-view movies from a vast collection, the profitability of the service providers and the satisfaction of the users would both be improved. The 300 plus channels mentioned, may use any type of transmission scheme that will deliver information via a cable or wireless path and includes but is not limited to time division multiplexed channels, frequency division multiplexed channels and packet data multiplexed channels.

35 One known approach for the TV programming schedule is to display the presently showing programs along with the next subsequent programs for the next hour or so, on what is referred to as a preview channel. Because this is more information than can be legibly displayed on one television screen at once, the preview channel display often scrolls through all the channel offering for the present time and the near future. For a sixty channel system, one complete scrolling takes about three minutes. At such a rate, a one hundred channel cable service would take five minutes and the future three hundred plus channel cable services would take 15 minutes. Needless to say, three minutes is a long time, but acceptable because breaks between programs are about that long. Five and fifteen minutes time periods though represent a substantial portion of a 30 minute program and are simply too long to expect a TV viewer to wait. The alternatives of speeding up the scrolling rate or using smaller size letters for descriptions are not practical either because either of these actions reduces the ability of the viewer to read and understand the schedule. Thus, there is a need in the art for a method and apparatus that allows a viewer to quickly find and select a desired data item from a large schedule, in this case a TV program for viewing from a TV programming schedule for 300 plus channels over the ensuing hours or even days. There is a similar need for a method and apparatus, very similar to the TV program selector, for finding and selecting a movie to order from movies-on-demand, or an airline flight(s) for a trip. It would further be desirable to use a method similar to the TV program selector to find and select a file in storage assets accessible by the apparatus to be executed, updated or deleted as part of file maintenance.

50 It is an object of the present invention to provide a view of a large schedule of data items and interactive selections of subgroups of the large schedule of data items in order to arrive at a screen display with sufficiently small number of items and sufficiently legible descriptions of each item to provide a viewer with an opportunity to make a reasoned selection therefrom.

55 It is another object of this invention to provide a method for interactively selecting a data item from a large schedule of data items by means of sequentially applying different filtering criteria using an interactive control having an operation appropriate for use with a television set.



Summary of the Invention

In another aspect of the invention, the aforementioned objects may be achieved by providing a method for a home television viewer to interactively select a data item from a large schedule of data items having multiple attributes. The method includes a step of receiving the large schedule of data items. The received schedule of data items is stored locally in a database format in order to expedite later filtering and retrieval. Next, the schedule of data items is filtered into a subgroup of the schedule of data items according to attributes selected by the interactive viewer inputs. The resulting subgroup of the schedule data items is displayed for the viewer's inspection. The user then interactively selects a data item from the subgroup of data items viewed on a television screen.

Briefly stated, in accordance with one aspect of the invention, the aforementioned objects are achieved by providing an apparatus for selecting an item from a large group in a system having display means and interactive movable pointing means for specifying a location in the display means and making a selection at a specified location. This apparatus includes a filtration means including subgroup specifiers in the display means and is responsive to selection of a subgroup specifier by the pointing means for filtering the list to produce the subgroup specified by the selected subgroup specifier; means for displaying representations of group items belonging to at least a portion of the subgroup in the display means; and group item selection means for selecting a group item by selecting the representation thereof in the display in response to the pointing means.

In yet another aspect of the invention, the aforementioned objects may be achieved by providing a method for a viewer to interactively select a program. The method includes a step of receiving program schedule data for at least 300 individual channels for a time period of at least a week. The received program schedule data is stored locally in a database format in order to expedite later sorting and retrieval. Next, the program schedule data is filtered into a subgroup of the program schedule data in response to interactive viewer inputs. The subgroup of the program schedule data is displayed for the viewer's inspection. The user then interactively selects a program from the subgroup of program schedule data for viewing on a TV screen, or alternatively for recording by an appropriate program recording device.

Brief Description of the Drawing

FIG. 1 is a pictorial of a television set connected through a set top box to a cable carrying the program to be selected and a controller for selecting that program.

FIG. 2 is a simplified block diagram of the set top box.

FIG. 3 is a pictorial of a controller as shown in FIG. 1.

FIG. 4 is a pictorial of a top most selection interactive display.

FIG. 5 is a pictorial of a second level selection interactive display.

FIG. 6 is a pictorial of a third level selection interactive display.

FIG. 7 is a pictorial of a first level selection query display.

FIG. 8 is a pictorial of a second level selection query display.

FIG. 9 is a pictorial of another third level selection query display.

FIG. 10 is a pictorial of a display showing a subgroup of programs meeting the Sports, All and On Now sorting criteria.

FIG. 11 is a pictorial of a display showing the subgroup of programs meeting the Sports, All and On Now sorting criteria along with a window having a preview of the highlighted program.

FIG. 12 is a pictorial of a display showing a second level selection interaction display, similar to FIG. 5.

FIG. 13 is a pictorial of a two-dimensional interactive grid display with very many program data items shown in reduced representations.

FIG. 14 is a pictorial of a third level selection query display, similar to FIG. 9.

FIG. 15 is a pictorial of a two-dimensional interactive grid display filtered down to a manageable number of data items.

FIG. 16 is a pictorial of a first alphanumeric interactive display.

FIG. 17 is the same display as FIG. 14 except that the highlighted interactive area is at a different location.

FIG. 18 is a pictorial of a second alphanumeric interactive display.

FIG. 19 is the same display as FIG. 16 except the highlighted interactive area is at a different location.

FIG. 20 is a pictorial of a third alphanumeric interactive display.

FIG. 21 is the same as FIG. 18 except that the highlighted interactive area is at a different location.

FIG. 22 is a pictorial of a fourth alphanumeric interactive display.

FIG. 23 is a pictorial of a two dimensional interactive display with logical third dimensional stacks for row and column intersections having multiple entries therein.

D tailed De cripti n

Referring now to FIG. 1, a television set (TV) 10 is connected to set top box (STB) 12 via interconnecting cable 14. STB 12 is also connected to cable 16 which carries at least one cable program. The TV 10 is any standard TV such as an NTSC, a high definition, or some other standard commercial type for home use. A controller 20 is linked to STB 12, preferably via a free space optical link 22 for controlling the operation of STB 12 in order to select a program for viewing.

Referring now to FIG. 2, STB 12 will be described in greater detail. The STB 12 has a cable interface 30 that selects and converts the incoming signals on cable 16, whether they are digital signals, analog signals, or packet signals, to signals that are compatible with the TV 10. The cable interface 30 is connected by bi-directional bus 32 to CPU 34. Bi-directional bus 32 carries digital information received over cable 16 for use by CPU 34 and digital information transmitted from CPU 34 to cable interface 30. If cable 16 is a bi-directional cable, some of the information from CPU 34 will be processed through cable interface 30 to cable 16.

In addition to bi-directional bus 32, CPU 34 is connected to ROM 38 and RAM 40 via a memory bus 36. ROM 38 contains an operating program that is executed by CPU 34 to provide most of the functionality of the STB 12. RAM 40, among other things, provides storage space for intermediate results of the operating program as executed by CPU 34. RAM 40 provides storage for data that is received from cable 16 and filtered in response to the operating program and viewer inputs from controller 20 (shown in FIG. 1). If further storage is needed for data, larger RAM devices and/or mass storage devices such as disk drives, may be also connected bi-directional bus 32 (not shown). To receive viewer input, CPU 34 is connected to controller interface 44 via bus 42, and to provide feedback to the viewer, CPU 34 is connected to and drives STB display 48 via bus 46 with channel related information.

FIG. 3 illustrates a preferred embodiment of the controller 20. Controller 20 is designed to look and operate like a standard remote control of a TV or a video cassette recorder (VCR). Controller 20 has a numeric keypad 50 having number keys 0-9. Controller 20 has an up arrow 52, a down arrow 54, a right pointing arrow 56, a left pointing arrow 58, a double up arrow 60 and a double down arrow 62. Controller 20 also has a select (✓) button 64, a cancel (X) button 66 and a query (?) button 68. All interactions with the interface provided by the present invention are controlled by various sequences of these 19 buttons of the controller 20. Further, the result of actuating one of these buttons will be similar the results of a similar action of a standard TV or VCR remote control, so its use will be familiar, predictable and intuitive to the viewer using it.

There are two broad classes of graphical components used in the interface of the present invention: those used by the viewer to select a desired data view or to apply a filter to the information being displayed, such as FIG. 4; and those components used to actually display the information through which the viewer will progress in order to make a selection of a specific item, such as FIG. 6. For example, the viewer might view the schedule of TV programs for the next few hours (all channels), and filter the display to show only sports, basketball games in particular. These choices fall into the first class. Once the display of all basketball shows for the next few hours has been selected, the viewer may progress through it reviewing a text or video digest of each program as selected by the controller 20. Selection of a specific program would typically lead to an action such as videotaping the show or setting an alarm to remind the viewer that the desired program is coming up. The navigation and selection sequences to find and select the desired program are examples of the use of the second class of graphical components.

Note, that in both cases the viewer is required to navigate through multiple graphic displays in order to ultimately select a desired program. The interfaces are kept conceptually and visually distinct in the interface according to the present invention because they serve different purposes and the viewer is reminded of this by their appearance. In addition, the information involved in the view selection components, i.e., the first class, falls naturally into the form of hierarchical menus: short lists with complex substructure. In contrast, the data display, i.e., the second class, components must be able to handle large schedules and arrays of information, which are essentially flat data with simple substructure.

Additionally, there is a display component in most displays referred to as a 'frame', which functions as a status display. The frame is used to give the viewer some context (what view am I displaying?), as well as a brief summary of the presently selected item's characteristics (what item do I currently have selected?). Typically the latter would be the item's full name and useful information such as program start and stop times. The frame will be described further, later.

Referring now to FIGs. 3 and 4, a top or beginning level display 400 of the viewer interface for use with controller 20 as it appears on the viewer's TV 10 (shown in FIG. 1) during normal operation. It is depicted as a file card menu 402 having a tab labeled "Begin". On file card menu 402 are interactive buttons labeled **Movies (on Demand)** 404, **Last Movie** 406, **Opti ns** 408, **TV** 410, **TV Now** 412, **Last TV** 414, **Sh pping** 416, and **Last Shop** 418 which when selected by means of the controller 20 cause the next relevant display to be shown along with some sorting and/or filtering to be performed on the data stored in RAM 40 (shown in FIG 2). When the file card menu 402 first appears, an active area, where a selection may be made, is highlighted. This active area may be moved by actuating the arrow

buttons 52-56 and double arrow buttons 60, 62 of controller 20. The file card menu 402 is surrounded by a frame 420, the top of which indicates the designation of the active area currently highlighted. Once an active area has been highlighted, a selection is made by actuating the **select** (✓) button 64 in FIG. 4, the TV button 410 is shown to be active: by actuating the **select** (✓) button 64, the next display 500 shown in FIG. 5 appears. This appearance is a logical overlaying of the display 500 over the display 400. Although display 400 is not visible while any logically overlaying display is appearing on the screen of the TV 10, display 400 will become visible again if all of the logically overlaying displays are canceled, i.e. by actuating the cancel (X) button 66. Thus, until a program is selected for real time viewing, it is possible for the viewer to work his or her way back to the display 400 by actuating the cancel (X) button the appropriate number of times.

FIG. 5 shows a second level display 500 which is depicted as a file card menu 502 labeled "TV", which appears to overlay and occlude all of file card menu 402 except for the label "Begin". The label TV indicates that the items that can be accessed are TV shows, such as dramatic series, situation comedies, serials, regular variety shows, game shows, sports, and so forth. Since movies and shopping were topics of other interactive buttons, these types of programs may be filtered out in whole or in part. File card menu 502 has interactive buttons labeled **On Now** 504, **Weekdays** 506, **Coming Up** 508, **Weekend** 510, and **Search** 512. As with the file card menu 402, file card menu 502 has an active area that can be moved by the viewer by operation of the arrow buttons 52-56 and double arrow buttons 60, 62 of controller 20 (shown in FIG. 3). Each of the interactive button represents another filtering that will be performed if it is selected. In FIG. 5, the **On Now** button 504 is highlighted, and if selected by actuating the **select** (✓) button 64, causes a third level display shown in FIG. 6 to appear and a further sorting and/or filtering of the data stored within RAM 40 (shown in FIG. 2).

Referring now to FIG. 6, display 600 shows what is on at the present time, which in this illustration is 6:30 p.m. A reduced representation 602 of all television shows that are on at the present time appears in FIG. 6. The reduced representation 602 presents each program that is presently on as a card in a tightly cascaded set of cards. The cards may be gray shade coded to distinguish between news shows, sport shows, dramatic shows, comedy shows, documentary shows and so forth. Those skilled in the art will recognize that color would be preferable for color television sets, and a method and apparatus according to the present invention using color to differentiated program types in the reduced representation 602 is contemplated. Thus, using visual coding within the reduced representation 602 would allow a sports program to visually stand out from the non-sports TV programming in the example shown. Up arrow 52 and Down arrow 54 respectively move a selection window 604, which is slightly wider than the items displayed in reduced representation 602, up and down the reduced representation 602 of the **On Now** subgroup in single steps. Motion of the active area along the reduced representation 602 is one dimensional, either up or down. The up arrows 60 and the down arrows 62 move this selection window 604 respectively up and down the reduced representation 602 in increments of six. The individual items visible and located within the selection window 604 represent a further subgroup of six programs out of the reduced representation 602 **On Now** subgroup. This six program subgroup of the selection window 604 is displayed in larger form in a grid display 606 located next to reduced representation 602. This larger form allows the viewer to read the titles of the programs presently in grid display 606. The visible coding, i.e. gray shade coding or color coding, of each item is retained in the larger form in grid display 606 to aid the viewer differentiate between the various types of programming offered.

Within selection window 604 and grid display 606 are active areas 605, 607 that highlight one item in their respective portions of display 600. The active areas 605, 607 move in coordination with each other in response to the Up arrow 52 and the Down arrow 54. When Up arrow 52 or Down arrow 54 require the active areas 605 and 607 to move above or below the selection window 604 and grid display 606, a paging occurs which moves the selection window up six or down six. When an item is located within active areas 605, 607, further information, such as the TV channel call sign, the cable channel number, and the exact start and stop times, is retrieved from the programming database stored in RAM 40 and displayed in the top of a frame 610 of display 600. If the **select** (✓) button 64 is actuated at this time, a preview of either a short text description or a brief still or motion video replaces the grid display 606. The data for these previews are stored in RAM 40. A second sequential actuation of the **select** (✓) button 64 actually selects the highlighted program in the active area 604 of reduced representation 602 and formerly highlighted in grid display 606. If the up arrow 52 or the down arrow 54 is actuated the respective preview for the next program item up or down from the previous previewed item is selected. The information displayed in the top of the frame 610 will change to the next program item up or down also. Actuation of the cancel button 66 returns the viewer to the previous arrangement of display 600. The bottom of the frame 610 lists the characteristics of the display 600, which are also retrieved from RAM 40. If the **query** (?) button 68 is actuated, the grid display 606 will be replaced by a generalized help menu. This generalized help menu has many buttons, as explained below, one of which is a view button. If the view button is actuated, the generalized help menu is replaced with the previous **select** (i.e. filter) view.

Referring now to FIGs. 3, and 7 a selection of a program by category will be described. Actuation of the **query** (?) button 68 of controller 20 causes display 700 to appear on the screen of TV 10 (shown in FIG. 1). On display 700 has a help button 702, a categories button 704, a view button 706, a begin button 708, a favorites button 710, and a user

button 712. An active area, shown on categories button 704 is moved by the arrow buttons 52-58. The function of the view button 706 has been discussed in regard to FIG. 6 and will not be repeated here. Actuation of the help button 702 causes a menu of specific help functions to be displayed. Actuation of the begin button 708 causes the beginning menu to be displayed, i.e. it takes the viewer back to the beginning of the selection sequence. Actuation of the favorites button 710 brings up a list of favorite programs for the present timeslot, which may either be accumulated by the CPU 32 from viewing data or may be entered by the viewer or viewers. Actuation of the viewer button 712, which causes a display to appear where a viewer may interactively enter his or her status as the principal viewer. This information is used to determine, display a slate of favorite programs customized for each viewer. Actuation of the categories button 704 causes a further display 800, which is shown in FIG. 8, to replace display 700 on the screen of TV 10.

Referring now to FIGs. 3, 8 and 9, display 800 has numerous buttons 801, 802, 803, 804, 805, 806, 807, 808, and 809 corresponding to Favorite, Information, Entertainment, Movies, Sports, News, Children, Series and More categories of programming. The buttons 801-809 may have an active area moved among them using arrows 52-58, or the numeric keypad may be used as a set of hot keys to move the active area to the desired category immediately. The buttons 801-809 are laid out in a 3x3 row and column arrangement just the same as the 1-9 keys of keypad 50 are arranged. Thus, without numbering, intuitive hot key navigation is possible. For example to move the active area to the button in the third column and third row, i.e. button 809, the key in the third column and the third row, i.e. the numeral 9, of keypad 50 is actuated. The button 809 unlike the other buttons which subsequently provide narrower choices, gives another display of buttons for further category choices (not shown). If the active area is around Sports button 805 as shown in FIG. 8, and the **select** (✓) button 64 is actuated, the display shown in FIG. 9 would appear. FIG. 9 is arranged with selection buttons 901-909 in a 3x3 arrangement, similar to that of FIG. 8. Movement of the active area by arrows 52-58 or by hot key is available in FIG. 9, as in FIG. 8. Buttons 901-909 correspond to Baseball, Football, Basketball, Soccer, All, Hockey, Golf, Racing and Other respectively. Except for All button 905, each of the buttons in FIG. 9 represents a narrower subgroup of the overall category of sports. Actuating All button 905 causes display 1000, shown in FIG. 10, to replace, i.e. logically overlay, display 900.

Referring now to FIG. 10, a filtered display for TV programs, that are On Now, for 6:30 p.m. local time as shown in FIG. 10, that are Sports programs showing All categories in reduced representation 1002 is shown. Reduced representation 1002 has so few entries that characteristics of the individual cards that were hidden previously by the sheer number of programs represented can now be discerned. For example, menu card 1003 representing the program *This Week in the NBA* is shorter on the left side than menu card 1004 representing the program *Senior PGA Golf*. The reason for that difference is that the program *This Week in the NBA* starts at 6:30 p.m., while the program *Senior PGA Golf* started at an earlier time as designated by the double left pointing arrows before the title of *Senior PGA Golf* in selection window 1006. Since *This Week in the NBA* and *Senior PGA Golf* both end at the same time, the right sides of their reduced representations 1003 and 1004 end at the same location. Movement or navigation of the active area 1005 along the reduced representation 1002 is by means of controller 20 the same as in FIG. 6. Each of the six titles shown in selection window 1006 has a respective rectangular region 1010-1015 thereafter. The rectangular regions 1010-1015 are shaded differently according to the type of sports program with which they are associated. These different shades of gray, or different colors if the display is shown on a color TV, are a visual key to the type of sport that corresponds to each of the six titles. Actuating the **select** (✓) button 64 of controller 20 causes display 1106, shown in FIG. 11, which is a text preview of the program highlighted by the active area, to overlay selection area 1006. As mentioned above, actuating the **select** (✓) button 64 at this point will cause CPU 34 to instruct cable interface 30 (shown in FIG. 2) to select that TV program for viewing.

Referring again to FIG. 10 if the status of the method and apparatus is the same as it was just after the selection that caused display 1000 to be shown was made, as described in the previous paragraph, and if the query (?) button 68 is actuated, then the display 700 shown in FIG. 7 with various selections will again be displayed. Further, if view button 706 is actuated, display 1200 as shown in FIG. 12 and its filter selections will logically overlay display 700. Display 1200 has numerous interactive buttons: On Now 1202, Coming Up 1204, Search 1206, Weekdays 1208 and Weekend 1210. Since the All Sports category has been selected previously, if the active area of display 1200 is moved to highlight the Coming Up button 1204 and the button 1204 is actuated, display 1300, shown in FIG. 13 will appear and overlay display 1200.

In display 1300, two coordinate axes are shown which are respectively labeled with two attributes of the selected subgroup of data items. The two attributes shown in display 1300 are channels and timeslots for the next 24 timeslots, i.e. 12 hours, coming up. Since the all sports category has been selected, each sports program showing on one of the 300 plus channels within the next 12 hours will be represented in display 1300. Each sports program upcoming is represented by a rectangular 'card' located in the row corresponding to the channel carrying the program and in the column(s) representing the timeslot(s) when it will be shown. Each 'card' is a color coded, reduced representation of the data item for its respective program. The viewer may move the active area 1302 among the cards using the up and down arrows 52, 54 and right and left arrows 56, 58 for movement vertically and horizontally, respectively. As can be seen from display 1300, there are still too many data items in the subgroup to individually consider

in a reasonable amount of time, so further filtering, either by a shorter time period, i.e. **On Now**, or a narrower category, i.e. basketball, is needed. To change to a narrower category, the viewer presses the query (?) button 68 which causes display 700 (shown in FIG. 7) to be displayed. Next, categories button 704 is selected which causes display 900 (shown in FIG. 9) to be displayed. Next, basketball button 903 is selected which causes display 1500 of FIG. 15 to be displayed. The **C** ming Up time filter of FIGs. 12 and 13 has not been changed, so display 1500 shows the basketball programs coming up in the next 12 hours. As can be seen, the two-dimensional grid display 1500 contains approximately sixteen programs, which is sufficiently small to review each item individually in a reasonable time period. Moving active area 1502 around two-dimensional grid display 1500 with the up and down arrows 52, 54 and/or the right and left arrows 56, 58, causes the title and channel of each program to be displayed in the top of the frame of display 1500 to assist the reviewing and selection process. For example, the program highlighted by active area 1502 is "This Week In the NBA" and it is showing on CNN. Thus, by selective filtering the unwieldy display 1300 of programs shown in FIG. 13 is reduced to a manageable handful of display 1500, which the viewer can navigate through individually in a reasonable time.

Referring now to FIGs. 16-23, another aspect of the present invention will be described. In FIG. 16 and the remaining figures, a longer period of time is selected other than the one and a half hours or so retrieved by the **On Now** selection. For example, if the viewer wishes to look at the programming available for the rest of the week in order to select something to record on a VCR (not shown). Actuating the button having the number zero (0) of the keypad 50 while watching a program causes the data view menu selection card, such as 900 of FIG. 9, to appear at the point in the menu-display hierarchy where the last selection was made. Actuating the zero (0) button again moves the viewer towards the broadest data view menu 400 of FIG. 4, and the viewer may stop at any display in order to change time or subject matter categories.

Thus if a viewer were watching *This Week in the NBA*, and wanted to find a program of interest that is on later, the viewer would first actuate the zero (0) button of keypad 50 which would bring up the display of FIG. 10. Actuating the zero (0) button four more times takes the viewer through displays 900, 800, 700 and 500 of FIGs. 9, 8, 7 and 5 respectively. To get a specific program title, the search button 509 is actuated, which causes FIG. 16 to logically overlay the display 500. FIG. 16 shows a first display 1600 of an interactive alphanumeric selection sequence. First, all alphabetic titles are sorted into groups of five or less. If, for example, *Nova* was the title of the desired program, the active area would be moved from its initial position (either at the top of the display or at the last group selected) to the group of letters containing the letter N using the up arrow 52 or the down arrow 54 as shown in FIG. 17 followed by actuation of the **select** (✓) button 64. This sequence would cause FIG. 18 to logically overlay FIG. 17. In FIG. 18, the active area is moved from its initial location at M to the location of N as shown in FIG. 17 followed again by actuation of the **select** (✓) button 64 causes the display 2000 of FIG. 20 to overlay FIG. 19. In display 2000 are single instances of the first two letters, such as NYPD Blue is the only instance of N followed by Y, and multiple instances of the two letter string as denoted by the double right pointing arrows by NO. To continue the search for *Nova*, the active area is moved to the line containing NO of display 2000 as shown in FIG. 21 using the down arrow 56 and actuating the **select** (✓) button 64, which causes display 2200 of FIG. 22 to overlay display 2000. Now, *Nova* is the only instance of a program beginning with NOV, so the entire title *Nova* appears in FIG. 22. By moving the active area to the line labeled NOVA in display 2200 and actuating the **select** (✓) button 64 causes the display 2300 shown in FIG. 23 to overlay display 2200 with a schedule of times and channels for the program series *Nova*.

FIG. 23 is a one week schedule that is laid out as a logical three dimensional grid. The days of the week are displayed along one side, in this case vertically along the left side, of the display 2300. Time of day is displayed along a perpendicular side, in this case horizontally across the top, for a twenty-four hour period. Thus, if an episode of *Nova* is scheduled at 8:00 p.m. on Sunday, a box of contrasting shade will be located in the intersection of the Sunday row and in the 8:00 p.m. column. The active area 2302 can be moved horizontally by arrows 56, 58 and vertically by arrows 52, 54 of keypad 50. If there are multiple occurrences of *Nova* on a particular night at a particular time, that fact is shown by a box, located at the intersection of the row of that day and the column of that time, having an asterisk (\*) located in the box. The asterisk (\*) indicates the presence of a logical stack of multiple programs of *Nova* appearing on competing channels, such as occurs on Wednesday night at 8:00 p.m. To move or navigate through a stack of programs (or stack of episodes of programs with the same name, for example) on a particular day at a particular time slot, the viewer uses the double up arrows button 60 and the double down arrows button 62 for this third degree of freedom. Because the display 2300 may require greater visual discrimination than program title as a matter of course, the frame information window 1904 is larger than usual for display 2300. Further, frame 2304 is annotated with arrows indicating the existence of program episodes above or below the active areas' position in the stack. If the cable 16 has access to 300 plus 'channels' of programming, it is conceivable that some programs, such as *Nova* will be offered by more than one channel at the same time. As described previously, once the viewer has moved the active area to a particular entry in two or three dimensions and actuates the **select** (✓) button 64, a selection is made. In this case, the selection sets an alarm to record a specific channel at a specific time at some day in the near future.

Referring back to FIGs. 1 and 2, overall operation of the apparatus of the invention is described. Program schedule

data is supplied via the cable 16. The program schedule data is either transmitted periodically and the STB 12 receives this program schedule data and stores it in RAM 40. Alternatively, all or part of the program schedule data could be dynamically requested and received by STB 12, which stores it in RAM 40. Program data such as this is commercially available from TVData, Inc. and other similar concerns. The data or records of the program schedule data are in a pre-arranged format, such as Microsoft Access or some other similar database format, to facilitate rapid storage, sorting and retrieval by CPU 34. Each record of a TV program has its date of appearance, its time of appearance, its title, its channel and/or network, its categorizations, and a textual or visual preview (if any). A listing of a prototype program that sorts, displays and interactively responds to a viewer's input is shown in the CPU program listing given below. This listing is in Visual Basic programming language of Microsoft Corporation.

The Visual Basic prototype program consists of a collection of forms, each form having its own set of event handlers. In this case, the only significant external events are button actuations because of the remote control interface. A frame form provides the background and information and status bars used by most of the individual displays. A rolodex form provides the menus. The other forms are mostly schedule or list displays of various kinds, including specialized varieties such as the alphanumeric selection list form.

The control part of the program begins with a procedure which loads all forms and activates the frame and rolodex, i.e. the top display, to begin. Forms hand off control by setting a return code and hiding themselves, thereby activating the form directly beneath (usually the frame). Both the frame form and the rolodex form perform different actions depending on the value of the return code. The frame form's most common action is to activate another form, and much of the control flow of the application is handled by the frame form code. The rolodex form is used to display several different menu hierarchies, most importantly view selection and filter choice.

===== COMING form code =====

This form displays a TV schedule for several hours of one day.  
This version uses drawing methods for the program shapes  
as opposed to creating a control shape for each program  
and "point & shoot" or "visually closest" navigation.

Option Explicit

Dim allData(8) As snapshot 'all data within time period  
Dim filterData(8) As snapshot 'a snapshot for each day in the view  
Dim NDays As Integer 'number of days in display  
Dim NSlots As Integer 'number of time slots in display  
Dim NStation As Integer 'number of stations in display  
Dim MaxStation As Integer 'total number of stations in database  
Dim colorField As String 'the database field that determines item color  
(the field should contain an integer)  
Dim inPreview As Integer 'boolean 'should the preview message show?  
Const sideGap = .05 'space at beginning and end of program  
Const topGAP = 4 'space btwn time label and first program shape  
Dim refDate 'reference date for data time slots  
Const lblHeight = 40 'height of day and time labels (in 500 scale)  
Const MINProgWidth = .2 'minimum width of a program shape as fraction of slot  
Dim slotsPerDay As Integer 'number of slots allowed per day  
Dim currDay 'number of current day  
Dim startTime 'start day and time of display

Dim TSBegin As Long 'first time slot  
Dim TSEnd As Long 'last time slot  
Dim TScurrent As Long 'current time slot  
Dim rowOffset 'distance between (tops of) rows in the schedule

Sub ApplyFilter ()  
'filter program data, keeping only the programs that match the query in filters(TV)  
'also makes sure the number of stations is correct  
'and the DB field determining the color is set  
Dim i As Integer 'counter

If InStr(filters(currDomain), "Station") Then  
NStation = 10 'note: this probably should be a variable or const, not 10  
colorField = "Type"  
Else  
NStation = MaxStation  
colorField = "Category"

End If  
For i = 1 To NDays  
allData(i).Filter = filters(currDomain)  
Set filterData(i) = allData(i).CreateSnapshot()  
Next i

End Sub

Sub ChangeSel (d As String)

'Performs the navigation according to the direction parameter  
Dim current, firstMatch 'database markers  
Dim success As Integer 'boolean  
Dim s As Integer 'station

```

Dim e          'FinishTS (end)
Dim TS As Long 'time-slot
Dim F As snapshot
Dim aDay As Integer
5 Dim dist As Long
Dim best As Long, bestMark 'as database marker

'set info about current place in database
current = filterData(currDay).Bookmark
10 Set F = filterData(currDay)
s = F("Station")
e = F("FinishTS")
TS = TScurrent
aDay = currDay
success = False
15 best = 9999

If d = "Right" Then
    'check immediate right
    F.MoveNext
20 If Not F.EOF Then
        TS = F("StartTS")
        'success = same station and starts right after current program
        success = (F("Station") = s) And (TS <= e + 1)
    End If
    If Not success Then
25 'check all to right for "closest"
        F.MoveFirst
        While Not F.EOF
            If F("FinishTS") > e Then
30 dist = VDistHoriz(s, e, F("Station"), F("StartTS"))
                If dist <= best Then
                    'save best so far
                    best = dist
                    success = True
                    bestMark = F.Bookmark
                End If
            End If
            F.MoveNext
        Wend
        If success Then
40 'move to the best one
            F.Bookmark = bestMark
            TS = F("StartTS")
        End If
    End If
    ElseIf d = "Left" Then
45 'check immediate left
        F.MovePrevious
        If Not F.BOF Then
            'success = same station and finishes right before current program
            success = (F("Station") = s) And (F("FinishTS") >= TS - 1)
            TS = F("StartTS")
50 End If
    End If

```

55



```

If Not success Then
  'check all to left for "closest"
  F.MoveFirst
5   While Not F.EOF
    If F("StartTS") < TScurrent Then
      dist = VDistHoriz(F("Station"), F("FinishTS"), s, TScurrent)
      If dist < best Then
        'keep best so far
        best = dist
        success = True
        bestMark = F.Bookmark
      End If
    End If
    F.MoveNext
15  Wend
    If success Then
      'move to best one
      F.Bookmark = bestMark
      TS = F("StartTS")
    End If
20  End If
  ElseIf d = "Down" Then
    'check all programs below current one, keeping "closest"
    While Not F.EOF
      If F("Station") > s Then
25      dist = VDistVert(s, TScurrent, e, F("Station"), F("StartTS"),
        F("FinishTS"))
        If dist < best Then
          best = dist
          success = True
          bestMark = F.Bookmark
        End If
      End If
      F.MoveNext
30  Wend
    If success Then
      F.Bookmark = bestMark
      TS = F("StartTS")
    End If
35  ElseIf d = "Up" Then
    'check all programs above current one, keeping "closest"
    While Not F.BOF
      If F("Station") < s Then
40      dist = VDistVert(s, TScurrent, e, F("Station"), F("StartTS"),
        F("FinishTS"))
        If dist < best Then
          best = dist
          success = True
          bestMark = F.Bookmark
        End If
      End If
      F.MovePrevious
50  Wend
    If success Then

```

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```

        F.Bookmark = bestMark
        TS = F("Start:TS")
    End If
End If
5
    If success Then
        'update variables and display
        TScurent = TS
        currDay = aDay
        DisplayProg
10
    Else
        'restore old position in databasse
        filterData(currDay).Bookmark = current
    End If
15 End Sub

Sub DisplayProg ()
    'set current program info in info box
    'highlight the appropriate program shape in the display
    Dim F As snapshot
    Dim msg As String
20
    Set F = filterData(currDay)

    'set highlight
    shpProg(0).Visible = False
25 selector.Visible = False
    Position shpProg(0), F("Start"), F("Finish"), F("Station")
    CPlace 0, selector, shpProg(0)
    shpProg(0).Visible = True
    selector.Visible = True
30
    'message for info box
    msg = StationString(F("Station")) & " - " & F("Title") & " "
    msg = msg & Format(F("Start"), "h:mm AM/PM")
    msg = msg & " to " & Format(F("Finish"), "h:mm AM/PM")
35 SetInfo msg, Color(F(colorField) Mod 9)
End Sub

Sub DoPreview ()
    'Construct an appropriate preview message and display it
    Dim msg As String
40
    msg = "Station: " & StationString(filterData(currDay)("Station"))
    msg = msg & Chr(13) & "Title: " & filterData(currDay)("Title") & Chr(13)
    msg = msg & CategoryString((filterData(currDay)("Type")),
(filterData(currDay)("Category")))
45 msg = msg & Chr(13) & "Time: " & Format(filterData(currDay)("Start"), "mmmm d,yy
h:mm AM/PM")
    msg = msg & Chr(13) & " to " & Format(filterData(currDay)("Finish"), "h:mm
AM/PM")

    'show popup with preview message
50 popup.Caption = msg

```

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```

        popup.Top = lblTime(1).Top + 2 * lblTim(1).Height
        popup.Left = 2
        popup.Width = slotsPerDay - 3
5       popup.Visible = True
        inPreview = True
    End Sub

```

```

Sub DoSelect ()
    set selection info and go to TV
10    userStation = filterData(currDay)("Station")
        userStart = filterData(currDay)("Start")
        returnCode = TOTV
        Me.Hide
    End Sub

```

```

15 Sub DrawProg (colorIndex, start, finish, station)
    'use drawing methods to draw a program shape
    'note: form.AutoRedraw should be set to true so the drawings are persistent
    Dim L, R, t, B 'left, right, top, bottom
    Dim dayStart
20    Dim edge

```

```

        'convert a day/time to position in NSlot scale
        dayStart = startTime + currDay - 1
        L = (start - dayStart) * 48
25    R = (finish - dayStart) * 48
        'clip shapes off at day boundaries
        If L < 0 Then L = 0
        If R > slotsPerDay Then R = slotsPerDay
        'place in correct day, with small gap between programs
        edge = (currDay - 1) * slotsPerDay
30    L = L + edge + sideGap
        R = R + edge - sideGap
        'correct for min width to make sure program will show up
        If R - L < MINProgWidth Then R = L + MINProgWidth
        'set top according to station
35    'note: this trick will not work if "favorite stations" are not numbered 1..n
        rowOffset = ((500 - 2 * lblHeight - shpProg(0).Height) / NStation)
        t = shpSlot(0).Top + topGAP + (station - 1) * rowOffset
        B = t + shpProg(0).Height
        'draw the box with the correct color
        drawwidth = 1
40    Me.FillStyle = 0 'solid
        Me.FillColor = Color(colorIndex Mod 9)
        Line (L, t) - Step(R - L, B - t), , B 'the line command with argument B draws a
        box
    End Sub

```

```

45 Sub Form_Activate ()
    'make necessary changes to display, reset info and status bars
    Dim i As Integer 'counter
    Static saveFilter As String
50    If saveFilter = filters(currDomain) Then sameFilter = True

```

55

```

saveFilter = filters(currDomain)
setStatus "TV Coming Up: " & currFilter(TV), gr yCOLOR
If newUser Then
    popup.Caption = "Press 'category' to change the kind of programs displayed."
    popup.Visible = True
    newUser = False
End If

'if not same filter, redo display
If Not sameFilter Then
    SetInfo "Loading program information...", GREY
    shpProg(0).Visible = False
    selector.Visible = False
    ApplyFilter
    MakeDisplay
End If

'in every case
DisplayProg
If inPreview Then DoPreview
End Sub

Sub Form_KeyDown (KeyCode As Integer, Shift As Integer)
    Select Case KeyCode
        Case Asc("Q")
            End
        Case B_BACK
            returnCode = BACK
            Me.Hide
        Case B_HELP
            InvokeHelp
        Case B_PREVIEW
            If inPreview Then
                popup.Visible = False
                inPreview = False
            Else
                inPreview = True
            End If
        Case B_RIGHT
            If Not filterData(currDay).EOF Then ChangeSel ("Right")
        Case B_LEFT
            If Not filterData(currDay).EOF Then ChangeSel ("Left")
        Case B_UP
            If Not filterData(currDay).EOF Then ChangeSel ("Up")
        Case B_DOWN
            If Not filterData(currDay).EOF Then ChangeSel ("Down")
        Case B_SELECT
            If Not filterData(currDay).EOF Then DoSelect
        Case B_PAGEDOWN
        Case B_PAGEUP
        Case B_FILTER
            returnCode = Filter
            Me.Hide
        Case B_0

```

```

        r turnCode = SHORTCUT
        Me.Hide
    End Select

5
    'in any cas
    If inPreview Then
        DoPreview
    Else
10        popup.Visible = False
    End If
End Sub

Sub Form_Load ()
15    Dim i As Integer
    Dim t 'as time

    'set form colors and fonts
    Me.BackColor = formCOLOR
    shpProg(0).BackColor = BorderColor
20    lblDay(0).BackColor = backgroundCOLOR
    lblAM.BackColor = backgroundCOLOR
    lblPM.BackColor = backgroundCOLOR
    selector.BorderColor = BorderColor
    dayLine(0).BorderColor = divideColor
    lblTime(0).ForeColor = slotCOLOR
25    shpSlot(0).BorderColor = slotCOLOR
    If displayMode = "TV" Then
        lblDay(0).FontSize = smallFONT
        lblTime(0).FontSize = smallFONT
        lblAM.FontSize = smallFONT
        lblPM.FontSize = smallFONT
30        popup.FontSize = mediumFONT
    Else
        lblDay(0).FontSize = largeFONT
        lblTime(0).FontSize = largeFONT
        lblAM.FontSize = largeFONT
35        lblPM.FontSize = largeFONT
        popup.FontSize = largeFONT
    End If

    'set scale and size objects
    SizeAForm Me, DispTop, DispHeight, DispLeft, DispWidth
40    Me.Scale (0, 0)-(500, 500)
    SizeAControl lblDay(0), 0, lblHeight, 0, 500
    'note: the AM/PM labels would be placed when time is filtered
    SizeAControl lblPM, 0, lblHeight, 0, 30
    SizeAControl lblAM, 0, lblHeight, 500 - 30, 30
    SizeAControl lblTime(0), lblHeight, lblHeight, 0, 50
45    SizeAControl shpSlot(0), 2 * lblHeight + .5 * topGAP, 500 - 2 * lblHeight, 0, 50
    SizeAControl popup, 250, 200, 250, 200
    selector.BorderWidth = 1
    dayLine(0).Y1 = 0
    dayLine(0).Y2 = 500
50    initialize variables

```

55

```

    startTime = fakeToday + fakeTime 'this would be set at activate to current half
hour
    NDays = 1
    slotsPerDay = 24
5    NSlots = NDays * slotsPerDay
    sameFilter = False
    sameView = False
    inPreview = False
    'set form scale and place permanent stuff (day and time labels)
10    Me.ScaleWidth = NSlots
    Load lblDay(1)
    SizeAControl lblDay(1), 0, lblHeight, 0, slotsPerDay
    lblDay(1).Caption = DayString(startTime, "long")
    lblDay(1).Visible = True
15    lblTime(0).Width = 1
    For i = 1 To slotsPerDay
        Load lblTime(i)
        lblTime(i).Move i - 1
        t = DateAdd("n", 30 * (i - 1), startTime) 'add 30 minute increments
        lblTime(i).Caption = TimeLabel(t)
20    lblTime(i).Visible = True
        lblTime(i).ZOrder
    Next i

    InputData
25    Form_Activate
    sameView = True
End Sub

Sub InputData ()
    'part of form_load
30    'opens the database and creates allData snapshots

    Dim DB As database
    Dim RefSnap As snapshot

35    Set DB = OpenDatabase(TVDB)

    'get reference date and number of stations
    Set RefSnap = DB.CreateSnapshot("Reference")
    RefSnap.FindFirst "Name = 'Date'"
    refDate = DateValue(RefSnap("Data"))
40    RefSnap.FindFirst "Name = 'NStations'"
    MaxStation = Val(RefSnap("Data"))

    Set allData(0) = DB.CreateSnapshot("Programs")
    'assumes data already sorted

45    'filter for particular time period; would happen at each half-hour change
    TSBEGIN = Abs(DateDiff("n", startTime, refDate) \ 30)
    TSEnd = TSBEGIN + slotsPerDay - 1 'check that slotsPerDay is set
    allData(0).Filter = Overlap(TSBEGIN, TSEnd)
    Set allData(1) = allData(0).CreateSnapshot()
50    Set allData(0) = Nothing 'won't be needing everything

```

55

End Sub

Sub MakeDisplay ()

'create the display of programs from the data

Dim i As Integer 'count r

Dim d As Integer 'day

Dim F As Snapshot 'convenience

If Not sameView Then

'would need to reset captions for times and day

End If

'place program shapes

Cls 'clear the form of previous drawings

DoEvents 'make it so

For d = 1 To NDays

currDay = d

'draw lines to separate time slots

For i = 0 To slotsPerDay

drawwidth = 4

Line (i, shpSlot(0).Top)-(i, 500), slotCOLOR

Next i

'draw program shape for each program in data

Set F = filterData(d)

If Not F.EOF Then

F.MoveFirst

Do While Not F.EOF

DrawProg F(colorField), F("Start"), F("Finish"), F("Station")

F.MoveNext

Loop

F.MoveFirst

End If

Next d

'initialize stuff

TScurrent = TSBEGIN

currDay = 1

shpProg(0).ZOrder

selector.ZOrder

Set F = filterData(currDay)

'find a program to start on

Do While TScurrent <= TSEnd

F.FindFirst Overlap(TScurrent, TScurrent)

If Not F.NoMatch Then

DisplayProg

Exit Do

End If

TScurrent = TScurrent + 1

Loop

'make sure TScurrent is in range

If TScurrent > TSEnd Then TScurrent = TSBEGIN

End Sub

Sub Position (shape As Control, start, finish, station)

```

'position a program shape control
  Dim relativ L, relativeW, dayStart
  Dim edge
5  'convert a day/time to position in NSlot scale
  dayStart = startTime - currDay - 1
  relativeL = (start - dayStart) * 48
  relativeW = (finish - dayStart) * 48 - relativeL
  'clip shapes off at day boundaries
  If relativeL < 0 Then
10    relativeW = relativeW + relativeL
    relativeL = 0
  End If
  If relativeW + relativeL > slotsPerDay Then relativeW = slotsPerDay - relativeL
  'set left and width of shape. leaving small gap between programs
15  edge = (currDay - 1) * slotsPerDay
  shape.Left = relativeL + edge + sideGap
  shape.Width = relativeW - 2 * sideGap
  'set minimum width so program is visible
  If shape.Width < MINProgWidth Then shape.Width = MINProgWidth
  'set top according to station.
20  'note: this will not work if "favorite" stations are not numbered 1..n
  rowOffset = ((500 - 2 * lblHeight - shpProg(0).Height) / NStation)
  shape.Top = shpSlot(0).Top + topGAP + (station - 1) * rowOffset
End Sub

25  Function VDistHoriz (station1, finish, station2, start)
  'computes a value for the "visual" left-right distance between two programs
  'requires that the earlier program come first
  'note: needs refinement, does not work satisfactorily, especially with crowded
  displays
  Dim deltaR, deltaT 'change in row and time
30  Dim row1, row2

  row1 = station1
  row2 = station2
  'note: row calculations could be more complicated if stations not numbered 1..n
35  deltaR = Abs(row1 - row2) * (100 / NStation)
  deltaT = (start - finish) * (100 / slotsPerDay)
  'penalize programs that are more up&down than to side
  If deltaT <= 1 Then deltaT = (finish - 3 - start) * (100 / slotsPerDay)
  If deltaT < 1 Then deltaT = 100 / slotsPerDay 'don't allow zero
  VDistHoriz = deltaR + deltaT
40  End Function

Function VDistVert (station1, start1, finish1, station2, start2, finish2)
  'computes a value for the "visual" up-down distance between two programs
  'note: needs refinement
45  Dim deltaR, deltaT 'change in row and time
  Dim row1, row2

  row1 = station1
  row2 = station2
  'note: row calculations could be more complicated if stations not numbered 1..n
50  deltaR = Abs(row1 - row2) / NStation

```

55



```

    If start1 > finish2 Then
        deltaT = Abs(start1 - finish2)
    ElseIf start2 > finish1 Then
        deltaT = Abs(start2 - finish1)
    Else
        deltaT = 0
    End If
    VDistVert = deltaR - 2 * deltaT
End Function

'===== FRAME form code =====
'This form owns the standard info and status bars and allows
'transfer of control from form to form.
Option Explicit

Sub Form_Activate ()
    'decides which other form should show in its display area
    Select Case returnCode
        Case SHOWVIEW
            views(currDomain).Show
        Case PICK
            frmSelect.Show
        Case TOTV
            frmTV.Show
        Case LASTVIEW
            sameFilter = True
            views(currDomain).Show
        Case STARTUP
            'do nothing--don't want rolodex to show yet
        Case Else
            frmDex.Show
    End Select
End Sub

Sub Form_KeyDown (KeyCode As Integer, Shift As Integer)
    If KeyCode = Asc("Q") Then
        End
    End If
End Sub

Sub Form_Load ()
    'set colors and fonts
    Me.BackColor = formCOLOR
    sspInfo.FontSize = mediumFONT
    sspStatus.FontSize = mediumFONT
    'use builtin object to size background
    ScrWidth = Screen.Width
    ScrHeight = Screen.Height
    If displayMode = "mini" Then
        'for taking screen prints
        ScrHeight = ScrHeight * .54
        ScrWidth = ScrWidth * .712
        displayMode = "TV"
    Else

```

```

        'resize to fit TV
        ScrHeight = ScrHeight * .63
    End If
5   's t form to fill scre n
    frmFrame.Top = 0
    frmFrame.Height = ScrHeight
    frmFrame.Left = 0
    frmFrame.Width = ScrWidth
10   'info line at top of screen
    sspInfo.Visible = True
    'status line at bottom of screen
    sspStatus.Visible = True
    'define available display area
    DispTop = sspInfo.Height + 1.5
15   DispHeight = frmFrame.Height - (sspStatus.Height + 1.5) - DispTop
    DispLeft = 0
    DispWidth = frmFrame.Width
End Sub

20   Sub SetupStatus ()
End Sub

'===== LIST form code =====
'This code is used for all three list forms (TV, Movies, Shopping)
Option Explicit
25   Dim DB As database 'full database with indexes

    Dim BlinkControl As Control 'set to blinking object (currently none)
    Dim itemSelected As Integer 'from 1 to MAXDISPLAY
    Dim locSelected As Integer 'from 1 to MAXLOC
30   Dim inPreview As Integer 'boolean
    Dim captionField As String 'the database field that is used for display
    Dim startTime 'the start time for the TV list
    Dim TS As Long 'the time slot for the TV list
    Dim rowOffset 'difference between tops of two consecutive reduced items
    Dim browsing As String 'type of current shopping list
35   Dim colorField As String 'field which determines color (should be of type integer)

    'display parameters
    Const MAXDISPLAY = 6 'Number of items in close up
    Dim MAXITEM As Integer 'Number of items in whole list
    Dim MAXLOC As Integer 'Number of locator positions
40   Dim whichrItem(MAXDISPLAY) As Integer 'which ritems are in the current display

    'define sizes of locator and selector
    Const GAP = 10 'space around lists
    Const EXTRA = 70 'room for longer programs
45   Const reducedEXTRA = 20 'room for longer programs in reduced rep
    Const T = 50 'reduced list
    Const H = 1000 - 2 * T
    Const locL = 30 'display area
    Const locW = 100
50   Const dispL = locW + 2 * locL
    Const dispW = 1000 - dispL - locL

```

55

```

'database snapshots
Dim allData As snapshot
5 Dim itemData As snapshot
Dim storeData As snapshot
Dim deptData As snapshot
Dim stuffData As snapshot
Dim filterData As snapshot
10 Dim marker(1000) As String 'bookmarks of each MAXDISPLAY items
Dim locStart(1000) 'rItem index for start of locator

Sub ApplyFilter ()
'filter the data according to user choice
Dim sortString As String
15

If Me Is TVlist Then
    captionField = "Title"
    sortString = ""
    colorField = "Type"
20 ElseIf Me Is MOVlist Then
    If sameView Then
        'keep allData as it is
    Else
        'reset allData to all movies
        LoadData
25         allData.Filter = viewFilter
        Set allData = allData.CreateSnapshot()
    End If
    captionField = "Title"
    sortString = "Title"
    colorField = "Type"
30 ElseIf Me Is SHOPlist Then
    'note: This would all be done totally differently. Don't bother
    '      understanding it, just rewrite it.
    Select Case filters(currDomain)
    Case "store"
35         browsing = "store"
        Set allData = storeData
        captionField = "name"
        filters(currDomain) = ""
        sortString = "name"
        colorField = ""
40     Case "dept"
        browsing = "dept"
        deptData.FindFirst "name = " & userString & ""
        userString = "" 'fix--this is cheating, I shouldn't use userString
        If deptData.NoMatch Then
45             Set allData = deptData
            filters(currDomain) = ""
        Else
            browsing = "stuff"
            filters(currDomain) = "[dept code] = " & deptData("code")
50             Set allData = stuffData
        End If
    End Select
End Sub

```

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```

captionField = "name"
sortString = "name"
colorField = ""
5   Case "item"
      browsing = "item"
      Set allData = itemData
      captionField = "name"
      colorField = ""
      filters(currDomain) = "name like " & userString & "..."
10      sortString = "name"
      Case Else
          browsing = "stuff"
          captionField = "name"
          sortString = "name"
          colorField = "{item code}"
15      Set allData = stuffData
      End Select
End If

allData.Filter = filters(currDomain)
20 If filters(currDomain) = "" Then
    allData.FindFirst "Not " & captionField & " = ..."
Else
    allData.FindFirst allData.Filter
End If
25 If allData.NoMatch Then
    MAXITEM = 0
Else
    MAXITEM = 1 'temporary setting just to make sure it isn't 0
    Set filterData = allData.CreateSnapshot()
    filterData.Sort = sortString
30    Set filterData = filterData.CreateSnapshot()
End If
End Sub

Sub BlinkStart (C As Control, vis)
35    Set BlinkControl = C
    BlinkControl.Visible = vis
    tmrBlink.Enabled = True
End Sub

Sub BlinkStop (vis)
40    tmrBlink.Enabled = False
    If BlinkControl Is Nothing Then
        'do nothing
    Else
        BlinkControl.Visible = True
    End If
45    Set BlinkControl = Nothing
End Sub

Sub ChangeLoc (direct As String)
50    'page up or down with the locator
    Select Case direct

```

55

```

Case "Up"
  If locSelected > 1 Then
    locSelected = locSelected - 1
    RedoDisplay
  End If
Case "Down"
  If locSelected < MAXLOC Then
    locSelected = locSelected + 1
    RedoDisplay
  End If
End Select
End Sub

Sub ChangeSel (direct As String)
  'navigate up or down one selection
  Select Case direct
    Case "Up"
      If itemSelected > 1 Then
        'move up within current display
        itemSelected = itemSelected - 1
        selector.Top = itemBox(itemSelected).Top - GAP
        rItem(0).Top = rItem(whichrItem(itemSelected)).Top
        rItem(0).Left = locL - GAP
        rItem(0).Width = locW + 2 * GAP
        SetItemInfo
      ElseIf locSelected > 1 Then
        'display previous section of list
        itemSelected = MAXDISPLAY
        locSelected = locSelected - 1
        RedoDisplay
      End If
    Case "Down"
      If itemSelected < MAXDISPLAY Then
        'move down within current display
        'do not move to select an empty item
        If (locSelected - 1) * MAXDISPLAY + itemSelected < MAXITEM Then
          itemSelected = itemSelected + 1
          selector.Top = itemBox(itemSelected).Top - GAP
          rItem(0).Top = rItem(whichrItem(itemSelected)).Top
          rItem(0).Left = locL - GAP
          rItem(0).Width = locW + 2 * GAP
          SetItemInfo
        End If
      ElseIf locSelected < MAXLOC Then
        'display next section of list
        itemSelected = 1
        locSelected = locSelected + 1
        RedoDisplay
      End If
    End Select
    rItem(0).Visible = True
  End Sub

Sub DoPreview ()

```

```

'show preview window and preview locator
Dim i As Integer 'counter

5      inPreview = True

      'hide other stuff
      locator.Visible = False
      selector.Visible = False
      For i = 1 To MAXDISPLAY
10         itemBox(i).Visible = False
         leftArrow(i).Visible = False
         rightArrow(i).Visible = False
      Next i

15      previewWin.Caption = "Getting preview..."
      previewWin.ZOrder
      previewWin.Visible = True

      ShowPreview
End Sub

20      Sub DoSelect ()
      'act on the current selected item

      If Me Is TVlist Then
25         'set selection data and go to TV
         userStation = filterData("Station")
         userStart = filterData("Start")
         returnCode = TOTV
         Me.Hide
      ElseIf Me Is MOVlist Then
30         'display "order movie" message
         sameFilter = True
         TellUser "You would be asked to confirm your order of " &
filterData("Title")
      ElseIf Me Is SHCPlist Then
35         Select Case browsing
         Case "stuff"
             sameFilter = True
             TellUser "You would be asked to confirm your order of " &
filterData("name")
40         Case "store"
             filters(currDomain) = "[store code] = " & filterData("code")
             Form_Activate
         Case "item"
             filters(currDomain) = "[item code] = " & filterData("code")
             Form_Activate
45         Case "dept"
             filters(currDomain) = "[dept code] = " & filterData("code")
             Form_Activate
         End Select
      End If
50      End Sub

```

55

```

Sub EndPreview ()
'go back to regular list operation
Dim i As Integer 'counter

5
    previewWin.Visible = False
    inPreview = False
    locator.Visible = True
    selector.Visible = True
    previewWin.Top = displayList.Top
10    RedoDisplay
End Sub

Sub Form_Activate ()
Dim i As Integer 'counter
15 Dim section As Integer 'count the number of locator locations
Dim NVisible As Integer 'tally the visible shapes in a section
Dim msg As String
Static saveFilter As String
Static saveView As String

20 'check new filters against current filters
If Not sameView Then sameView = (saveView = viewFilter)
saveView = viewFilter
If Not sameFilter Then sameFilter = (saveFilter = filters(currDomain))
saveFilter = filters(currDomain)

25 SetStatus currView(currDomain) & currFilter(currDomain), greyCOLOR

If sameFilter And sameView Then
    'keep everything the same as last time
    If newUser And Not Me Is SHOPlist Then
30         popup.Caption = "To change the category shown, press the 'Category'
button."
        popup.Visible = True
        newUser = False
    End If
    RedoDisplay
35 Else
    'clean up display
    SetInfo "Selecting data, please wait...", GREY
    If MAXITEM = 0 Then
        previewWin.Caption = ""
        previewWin.Visible = False
40    End If
    DoEvents
    If inPreview Then EndPreview

    For i = 1 To MAXDISPLAY
45        itemBox(i).Caption = ""
    Next i

    For i = 1 To MAXITEM
        Unload rItem(i)
50    Next i

```

55

```

'filter new data
ApplyFilter
5   If MAXITEM = 0 Then
      'give 'no matches' msg
      locator.Visible = False
      rItem(0).Visible = False
      For i = 1 To MAXDISPLAY
          MAXITEM = 0
10      itemBox(i).Visible = False
          leftArrow(i).Visible = False
          rightArrow(i).Visible = False
      Next i
      previewWin.Caption = "No matches were found" & Chr(13)
15      previewWin.Caption = previewWin.Caption & "Press 'Category' to change
the selection."
      previewWin.ZOrder
      previewWin.Visible = True
      itemSelected = 0
      locSelected = 0
20   Else
      'redo list display
      filterData.MoveLast
      MAXITEM = filterData.RecordCount
      'set distance between items
25      rowOffset = (H - rItem(0).Height) / MAXITEM
      If rowOffset > rItem(0).Height + GAP Then rowOffset = rItem(0).Height -
GAP 'max distance
      rItem(0).Visible = False
      rItem(0).Top = T
      rItem(0).Left = locL + reducedEXTRA
30      rItem(0).Width = locW - 2 * reducedEXTRA
      rItem(0).BackColor = itemCOLOR
      filterData.MoveFirst
      'size and place the item shapes
      'and set section bookmarks
35      section = 0 'number of locator locations
      NVisible = MAXDISPLAY 'so first section will be marked correctly
      For i = 1 To MAXITEM
          Load rItem(i)
          If colorField <> "" Then
40              rItem(i).BackColor = Color(Val(filterData(colorField)) Mod 9)
          End If
          NVisible = NVisible + 1
          rItem(i).Top = T + (i - 1) * rowOffset
          If NVisible > MAXDISPLAY Then
              'begin a new locator location
45              section = section + 1
              locStart(section) = 1
              marker(section) = filterData.Bookmark
              NVisible = 1
          End If
          If Me Is TVlist Then
50              'set length of reduced item

```

55



```

        If filterData("StartTS") < TS Then
            rItem(i).Left = rItem(i).Left - reducedEXTRA
            rItem(i).Width = rItem(i).Width + reducedEXTRA
5      End If
        If filterData("FinishTS") > TS Then
            rItem(i).Width = rItem(i).Width - reducedEXTRA
        End If
    End If
    rItem(i).ZOrder
10    rItem(i).Visible = True
    filterData.MoveNext
Next i
MAXLOC = section
locStart(section + 1) = MAXITEM + 1
15
    'set length of minselector (use rItem(0))
    rItem(0).Left = locL - GAP
    rItem(0).Width = locW + 2 * GAP

    'initialize selector and locator
20    itemSelected = 1
    locSelected = 1
    locator.Visible = True
    rItem(0).BackColor = highlightCOLOR
    'set the captions in the itemBoxes
    RedoDisplay
25    End If
End If
End Sub

30 Sub Form_KeyDown (KeyCode As Integer, Shift As Integer)
    popup.Visible = False
    Select Case KeyCode
        Case Asc("Q")
            End
        Case B_BACK
35         If Me Is SHOPlist And browsing = "item" Then
            'not exactly what we want
            returnCode = ALPHA
            Me.Hide
        Else
40         returnCode = BACK
            Me.Hide
        End If
        Case B_HELP
            InvokeHelp
        Case B_PREVIEW
45         If inPreview Then
            EndPreview
        Else
            DoPreview
        End If
        Case B_SELECT
50         If MAXITEM > 0 Then DoSelect
    End Sub

```

55

```

Case B_UP
  If MAXITEM > 0 Then ChangeS 1 ("Up")
Case B_DOWN
  If MAXITEM > 0 Then ChangeSel ("Down")
5 Case B_RIGHT
  If Me Is TVlist Then
    returnCode = COMING
    Me.Hide
  End If
10 Case B_LEFT
Case B_PAGEUP
  If inPreview Then
    'scroll preview
    If previewWin.Top < displayList.Top Then
      'move preview window down a screen
15 previewWin.Top = previewWin.Top + displayList.Height
    End If
  Else
    If MAXITEM > 0 Then ChangeLoc ("Up")
  End If
20 Case B_PAGEDOWN
  If inPreview Then
    'scroll preview
    If previewWin.Top + previewWin.Height > displayList.Top +
displayList.Height Then
25 'move preview window up a screen
    previewWin.Top = previewWin.Top - displayList.Height
  End If
  Else
    If MAXITEM > 0 Then ChangeLoc ("Down")
  End If
30 Case B_FILTER
  If Not Me Is SHOPlist Then
    returnCode = Filter
    Me.Hide
  End If
35 Case B_0
  returnCode = SHORTCUT
  Me.Hide
End Select
End Sub

40 Sub Form_Load ()
  Dim i As Integer 'counter
  Dim itemRoom

  'set colors and fonts
45 itemBox(0).FontSize = largeFONT
  leftArrow(0).FontSize = largeFONT
  rightArrow(0).FontSize = largeFONT
  If displayMode = "PC" Then
    popup.FontSize = largeFONT
    previewWin.FontSize = largeFONT
50 Else
55

```

```

        previewWin.FontSize = mediumFONT
        popup.FontSize = smallFONT
    End If
5   rIt m(0).BackColor = itemCOLOR
    s selector.FillColor = highlightCOLOR
    displayList.FillColor = backgroundCOLOR
    previewWin.BackColor = backgroundCOLOR
    locator.FillColor = backgroundCOLOR
    itemBox(0).BackColor = itemCOLOR
10   leftArrow(0).BackColor = itemCOLOR
    rightArrow(0).BackColor = itemCOLOR
    shpSlot.BorderColor = slotCOLOR
    'size the objects to the screen
    SizeAForm Me, DispTop, DispHeight, DispLeft, DispWidth
15   Me.Scale (0, 0)-(1000, 1000)
    SizeAControl locator, T - GAP, H + GAP, locL - GAP, locW + 2 * GAP
    SizeAControl shpSlot, T, H, locL + reducedEXTRA, locW - 2 * reducedEXTRA
    SizeAControl displayList, T - GAP, H + GAP, dispL, dispW
    SizeAControl popup, dispW / 2, 4 * locW, dispW / 2, 4 * locW
    CPlace 1, previewWin, displayList
20   locator.ZOrder
    shpSlot.ZOrder
    rItem(0).ZOrder
    itemRoom = H / MAXDISPLAY
    SizeAControl itemBox(0), T + (.5 * GAP), itemRoom - GAP, dispL + EXTRA, dispW -
25   2 * EXTRA
    SizeAControl patch(0), 50, (6.8 * itemBox(0).Height), (12.3 * itemBox(0).Width),
    (7 * itemBox(0).Height)
    If displayMode = "TV" Then
        patch(0).Left = 8.08 * itemBox(0).Width
        patch(0).Height = 3.7 * itemBox(0).Height
30   End If
    SizeAControl leftArrow(0), T + (.5 * GAP), itemRoom - GAP, dispL, EXTRA
    SizeAControl rightArrow(0), T + (.5 * GAP), itemRoom - GAP, dispL + dispW -
    EXTRA, EXTRA
    SizeAControl selector, T, itemRoom + GAP, dispL, dispW
35   selector.ZOrder
    For i = 1 To MAXDISPLAY
        'Load itemBox(i) 'Now created at design time--fixed number (6)
        itemBox(i).Visible = False
        CCopy itemBox(0), itemBox(i)
        patch(i).Visible = False
40   CPlace 0, patch(i), patch(0)
        itemBox(i).Top = itemBox(0).Top + (i - 1) * itemRoom
        Load leftArrow(i)
        leftArrow(i).Top = itemBox(i).Top
        Load rightArrow(i)
        rightArrow(i).Top = itemBox(i).Top
45   Next i

    'load the list data and set up the display
    sameFilter = False
    sameView = False
50   LoadData

```

55

```

Form_Activate
sameFilter = True
End Sub

5
Function ItemString () As String
'set msg to be used in info bar
Dim msg As String

    If Me Is TVlist Then
10      msg = Format(filterData("Title")) & " on "
        msg = msg & StationString(filterData("Station")) & ", "
        msg = msg & TimeString(filterData("Start")) & " to "
        msg = msg & TimeString(filterData("Finish"))
    ElseIf Me Is MOVlist Then
15      msg = Format(filterData("Title"))
        msg = msg & ", " & Format(filterData("Year"))
    ElseIf Me Is SHOPlist Then
        Select Case browsing
            Case "stuff"
20          msg = Format(filterData("name")) & " - $" & Format(filterData("price"))
        End Select
    End If
    ItemString = msg
End Function

25
Sub LoadData ()
Dim refSnap As snapshot
Dim refDate

'load in the database as a snapshot
If Me Is TVlist Then
30  startTime = fakeToday + fakeTime
    Set DB = OpenDatabase(TVDB)
    Set refSnap = DB.CreateSnapshot("Reference")
    refSnap.FindFirst "Name = 'Date'"
    refDate = DateValue(refSnap("Data"))
35  Set allData = DB.CreateSnapshot("Programs")
    'filter for time would really happen at activate
    TS = (startTime - refDate) * 48
    allData.Filter = Overlap(TS, TS)
    Set allData = allData.CreateSnapshot()
ElseIf Me Is MOVlist Then
40  Set DB = OpenDatabase(MVDB)
    Set allData = DB.CreateSnapshot("Movies")
ElseIf Me Is SHOPlist Then
    Set DB = OpenDatabase(SPDB)
    Set itemData = DB.CreateSnapshot("Items")
45  Set storeData = DB.CreateSnapshot("Stores")
    Set deptData = DB.CreateSnapshot("Departments")
    Set stuffData = DB.CreateSnapshot("Stuff")
End If
End Sub

50
Sub RedoDisplay ()

55

```

'set the captions in the itemBoxes to correspond to items in locator  
' reposition locator and selector, update info box

```

5      Dim last As Integer
      Dim i As Integer
      Dim Index As Integer 'index of rItem

      If MAXITEM = 0 Then Exit Sub
      'figure first item location
10     filterData.Bookmark = marker(locSelected)

      Index = locStart(locSelected)
      For i = 1 To MAXDISPLAY
          If filterData.EOF Then
15             'hide empty itemBox
             itemBox(i).Caption = ""
             itemBox(i).Visible = False
             leftArrow(i).Visible = False
             rightArrow(i).Visible = False
          Else
20             whichrItem(i) = Index 'so we can highlight the correct rItem (reduced
item)
             If colorField <> "" Then itemBox(i).BackColor =
Color(filterData(colorField) Mod 9)
             itemBox(i).Caption = filterData(captionField)
25             If Not inPreview Then itemBox(i).Visible = True
             If Me Is TVlist And Not inPreview Then
                 'show arrows to reflect program length
                 If filterData("StartTS") < TS Then
                     leftArrow(i).BackColor = itemBox(i).BackColor
                     leftArrow(i).Visible = True
30                 Else
                     leftArrow(i).Visible = False
                 End If
                 If filterData("FinishTS") > TS Then
                     rightArrow(i).BackColor = itemBox(i).BackColor
                     rightArrow(i).Visible = True
35                 Else
                     rightArrow(i).Visible = False
                 End If
                 'show color patch for subcategory
                 patch(i).FillColor = Color(filterData("Category") Mod 9)
40                 patch(i).Visible = True
             End If
             last = i
             Index = Index + 1
             filterData.MoveNext
45         End If
      Next i

      'Do not allow blank to be selected
      If itemSelected > last Then
          itemSelected = last
50     End If

```

55

```

        'fix the rest of the display
        displayList.Height = H + 2 * GAP - (H / MAXDISPLAY * (MAXDISPLAY - last))
5      'display list shrinks when fewer than MAXDISPLAY items displayed
        selector.Top = itemBox(itemSelected).Top - GAP 'behind current itemBox
        locator.Top = T + rowOffset * (locStart(locSelected) - 1)
        locator.Height = last * rowOffset + rItem(0).Height - rowOffset 'height shrinks
when displayList shrinks
        rItem(0).Top = rItem(whichrItem(itemSelected)).Top
10      SetItemInfo
End Sub

Sub SetItemInfo ()
'display current item's info in info bar
15      Dim i As Integer '* of records away from bookmark we need to go
        Dim msg As String

        'find selected record
        filterData.Bookmark = marker(locSelected)
        i = itemSelected
20      While (i > 1)
            filterData.MoveNext
            i = i - 1
        Wend
        'Put info in the info bar
25      SetInfo ItemString(), (itemBox(itemSelected).BackColor)
        'update preview window if needed
        If inPreview Then ShowPreview
End Sub

Sub ShowPreview ()
30      'Display the video, still, or text preview
        ' of the item selected
        Dim msg As String
        If Me Is MOVlist Then
            msg = filterData("Plot")
35      ElseIf Me Is TVlist Then
            msg = filterData(captionField) & Chr(13)
            msg = msg & StationString(filterData("Station")) & Chr(13)
            msg = msg & CategoryString((filterData("Type")), (filterData("Category")))
        Else
40          msg = "This would be a video, still, or textual preview of '"
            msg = msg & filterData(captionField)
            msg = msg & "'
        End If
        previewWin.Visible = False
        previewWin.Caption = msg
45      CPlace 0, previewWin, displayList
        previewWin.Visible = True
End Sub

Sub tmrBlink_Timer ()
50      BlinkControl.Visible = Not BlinkControl.Visible
End Sub

```

55

```

'***** MESSAGE form code *****
'This form is used by Help and some lists to display information.
5 ' temporarily covering up the current form.
Option Explicit

Const GAP = 500

10 Sub Form_Activate ()
    textArea.Caption = userMsg
End Sub

Sub Form_KeyDown (KeyCode As Integer, Shift As Integer)
    Select Case KeyCode
15         Case Else
            returnCode = KeyCode
            Me.Hide
        End Select
    End Sub

20 Sub Form_Load ()
    'set colors and fonts
    Me.BackColor = itemCOLOR
    textArea.BackColor = itemCOLOR
    textArea.FontSize = largeFONT
25 'set sizes
    SizeAForm Me, DispTop, DispHeight, DispLeft, DispWidth
    SizeAControl textArea, GAP, DispHeight - 2 * GAP, GAP, DispWidth - 2 * GAP
    'initialize
    textArea.Caption = ""
30 End Sub

'***** ROLODEX form code *****
'This form shows the main menu and filter menus.
'Unimplemented: Have filter button color correspond to type/category color
Option Explicit

35 Dim BlinkControl As Control 'pointer to blinking highlight
Dim parent As Integer 'number of parent card
Dim current As Integer 'number of current card

' special cards
40 'note: these must be updated each time the number of filter cards in the card
    datafile changes
Const filterCARD = 1 'TV filter menu
Const mfilterCARD = 68 'movie filter menu
Const homeCARD = 96 'main menu
45 Dim lastCard As Integer 'holds number of regular card while in filter

Const MAXTITLE = 3 'WARNING: A change in MAXTITLE requires a change in code for
LoadGraphics
Const CARDSHIFT = 2.5 'for card display--amount change in card placement
Const MAXROWS = 3 'for card display--number of rows of buttons
50 Const MAXCOLS = 3 'for card display--number of columns of buttons on a card

55

```

```

Const MAXCARD = 9 'max number of cards that can be displayed on screen
Const MAXITEM = 9 'max number of buttons on a card

5  'action codes: tell what action to take for a button choice
  'actions greater than actNEXT need additional input
Const actCOMING = 2
Const actNOW = 3
Const actNEXT = 5
Const actALPHASHOP = 6
10 Const actFILTER = 7
Const actALPHATV = 8
Const actALPHAMOV = 9
Const actDOMAIN = 10
Const actLATER = 11
15 Const actWEEK = 12
Const actWKEND = 13
Const actSCHED = 14
Const shortTVVIEW = 30
Const shortMVVIEW = 31
Const shortSPVIEW = 32
20 Const shortTVNOW = 35
Const shortTVFAV = 36
Const shortMVFAV = 37
Const shortSPFAV = 38
Const actMOVIE = 40
25 Const actSTORE = 50
Const actDEPT = 52
Const actMORE = 60
Const actNONE = 65
  'for development only
30 Const actKEYS = 71
Const actTABS = 72

```

```

Sub Animate (direct As String, cardNo As Integer)
  'Animate opening another card, backing up, or selecting a button
  Dim index As Integer
35  Dim depth As Integer

  DoEvents 'do not interrupt another animation
  depth = Cards(current).level
  Select Case direct
  Case "Back"
40    If Cards(current).parent > 0 Then
      CCopy sspCard(depth), sspCont
      sspCont.Visible = True
      Zoom 10, sspCont, sspItem(Cards(current).self)
      DisplayCard (Cards(current).parent)
      sspCont.Visible = False
45    End If
  Case "Next"
    index = Cards(current).selected
    If index > 0 Then
50      CCopy sspItem(index), sspCont
      sspCont.Visible = True

```

55



```

    sspCont.BackColor = sspCard(0).BackColor
    Zoom 10, sspCont, sspCard(depth)
    DisplayCard cardNo
5    sspCont.Visible = False
    End If
    Case "Select"
        index = Cards(current).selected
        If index > 0 Then
10            CCopy sspItem(index), sspCont
            sspCont.Visible = True
            sspCont.BackColor = sspCard(0).BackColor
            SizeAControl sspCard(0), 0, 500, 0, 500 'size of whole form
            Zoom 10, sspCont, sspCard(0)
        End If
    End Select
15 End Sub

Sub BlinkStart (C As Control, vis)
    'enable blinking object
    Set BlinkControl = C
20    BlinkControl.Visible = vis
    tmrBlink.Enabled = True
End Sub

Sub BlinkStop (vis)
25    'stop blinking object, leaving visibility as vis
    tmrBlink.Enabled = False
    If BlinkControl Is Nothing Then
        'do nothing
    Else
30        BlinkControl.Visible = vis
    End If
    Set BlinkControl = Nothing
End Sub

Sub ButtonAction ()
35    'perform action associated with selected button
    Dim button As Integer
    Dim cardNo As Integer
    Dim msg As String

40    button = Cards(current).selected 'item number of selected button on parent card
    cardNo = Cards(current).item(button) 'card number of selected button
    If button < 1 Then Exit Sub

    Select Case Cards(cardNo).actionCode
    Case actNONE
45        'an inactive button
        SetInfo "This option is not yet available.", greyCOLOR
    Case actNEXT
        'display the next card
        Animate "Next", Cards(current).item(button)
    Case actDOMAIN
50        'change current domain before going to the next card

```

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```

currDomain = Val(Cards(cardNo).actionData)
setStatus Cards(cardNo).name, greyCOLOR
Animate "Next", Cards(curr nt).item(button)
5 Case actMORE
  'show mor choic s on same topic (currently same as actNEXT)
  Animate "Next", Cards(current).item(button)
Case actCOMING
  'show schedule of what's coming up on TV
  Animate "Select", 0
10 sameFilter = False
  Set views(currDomain) = frmComing
  returnCode = SHOWVIEW
  Me.Hide
Case actNOW
  'show what's on TV now
15 currView(currDomain) = "TV 6:30pm : " 'obviously, this would be the current
time
  Animate "Select", 0
  sameFilter = False
  sameView = True
20 Set views(currDomain) = listFrm(currDomain)
  returnCode = SHOWVIEW
  Me.Hide
Case actLATER
  'show what's on TV for a later day
  'currently non-functional
25 Animate "Select", 0
  sameFilter = False
  Set views(currDomain) = frmFriday
  returnCode = SHOWVIEW
  Me.Hide
30 Case actWEEK
  'show TV schedule for weekdays
  Animate "Select", 0
  sameFilter = False
  Set views(currDomain) = frmWkday
35 returnCode = SHOWVIEW
  Me.Hide
Case actWKEND
  'show TV schedule for weekend
  'currently non-functional
  Animate "Select", 0
40 sameFilter = False
  Set views(currDomain) = frmWkend
  returnCode = SHOWVIEW
  Me.Hide
Case actSCHD
  'show TV schedule
  'currently non-functional
45 Animate "Select", 0
  sameFilter = False
  Set views(currDomain) = frmSched
  returnCode = SHOWVIEW
50 Me.Hide

```

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```

Case actALPHASHOP
  'get a string from user, search for items beginning with user string
  'note: this would probably be v ry differ nt
  5  Animate "Select", 0
  SetStatus "Shopping, " & Cards(cardNo).name, greyCOLOR
  msg = Cards(cardNo).actionData
  SetInfo msg, YELLOW
  Wait frmAlpha
  10  If returnCode <> BACK And userString <> "" Then
        sameFilter = False
        filters(currDomain) = "item"
        Set views(currDomain) = listFrm(currDomain)
        returnCode = SHOWVIEW
        Me.Hide
  End If
  15  Case actALPHATV
        'allow user to select a show title
        Animate "Select", 0
        SetStatus "TV, " & Cards(cardNo).name, greyCOLOR
        returnCode = PICK
  20  Me.Hide
  Case actALPHAMOV
        'This is not hooked up to work, but would probably be
        ' a lot like actALPHTV
        Animate "Select", 0
  25  Case actFILTER
        'send a new filter to a TV view
        filters(currDomain) = Cards(cardNo).actionData
        currFilter(currDomain) = Cards(cardNo).infotext
        sameFilter = False
        sameView = True
  30  returnCode = SHOWVIEW
        Me.Hide
  Case actMOVIE
        'show a movie list
        Animate "Select", 0
  35  If current > homeCARD Then
        'the view (a filter) is changing
        currView(currDomain) = Cards(cardNo).infotext
        viewFilter = Cards(cardNo).actionData
        sameView = False
        sameFilter = False
  40  Else
        'the category is changing
        currFilter(currDomain) = ": " & Cards(cardNo).infotext
        filters(currDomain) = Cards(cardNo).actionData
        sameView = True
        sameFilter = False
  45  End If
        Set views(currDomain) = listFrm(currDomain)
        returnCode = SHOWVIEW
        Me.Hide
  Case actSTORE
  50  'show a list of stores

```

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```

    Animate "Select", 0
    SetInfo "Choose a store:", TURQUOISE
    SetStatus "Shopping", greyCOLOR
    sameFilter = False
    filters(currDomain) = "store"
    Set views(currDomain) = listFrm(currDomain)
    returnCode = SHOWVIEW
    Me.Hide
Case actDEPT
    'show products from a department
    Animate "Select", 0
    SetStatus "Shopping, " & Cards(cardNo).infotext, greyCOLOR
    sameFilter = False
    filters(currDomain) = "dept"
    userString = Cards(cardNo).name
    Set views(currDomain) = listFrm(currDomain)
    returnCode = SHOWVIEW
    Me.Hide
Case shortTVVIEW
    'Show last TV schedule or list
    Animate "Select", 0
    currDomain = TV
    If views(currDomain) Is Nothing Then
        Set views(currDomain) = frmComing
    End If
    sameFilter = True
    returnCode = SHOWVIEW
    Me.Hide
Case shortMVVIEW
    'Show lat movie list
    Animate "Select", 0
    currDomain = MOVIE
    If views(currDomain) Is Nothing Then
        Set views(currDomain) = listFrm(currDomain)
    End If
    sameFilter = True
    returnCode = SHOWVIEW
    Me.Hide
Case shortSPVIEW
    'Show last shopping view
    Animate "Select", 0
    currDomain = SHOP
    If views(currDomain) Is Nothing Then
        Set views(currDomain) = listFrm(currDomain)
    End If
    sameFilter = True
    returnCode = SHOWVIEW
    Me.Hide
Case shortTVNOW
    'show all TV shows on now
    currFilter(currDomain) = "All Categories"
    currView(currDomain) = "TV 6:30pm : " 'obviously, this would be the current
time
    Animate "Select", 0

```

```

currDomain = TV
filters(currDomain) = ""
sameFilter = False
5 sameView = True
Set views(currDomain) = listFrm(currDomain)
returnCode = SHOWVIEW
Me.Hide
Case actKEYS
'Only for development, wouldn't stay
10 SetKeys Cards(cardNo).actionData
SetStatus Cards(cardNo).infotext, itemCOLOR
current = homeCARD
DisplayCard current
Case actTABS
'only for development
15 ToggleTabs
Case Else
MsgBox "Bad action code for card " & Cards(cardNo).name
Stop
End
20 End Select
End Sub

Sub ChangeSel (direct As String)
'do button navigation
25 Dim n As Integer
Dim last As Integer, Sel As Integer
n = Cards(current).NItems
last = Cards(current).selected
If last = 0 Then Exit Sub

30 If direct = "Right" Then
'move right with wrap around
If last = n Then
Sel = 1
Else
35 Sel = last + 1
End If
ElseIf direct = "Left" Then
'move left with wrap around
If last = 1 Then
Sel = n
40 Else
Sel = last - 1
End If
ElseIf direct = "Up" Then
'move up, no wrap around
45 If last > MAXCOLS Then
Sel = last - MAXCOLS
Else
Sel = last
End If
ElseIf direct = "Down" Then
50 'move down, no wrap around

```

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```

        If last <= n - MAXCOLS Then
            Sel = last + MAXCOLS
        Else
5           Sel = last
            End If
        Else
            MsgBox "Bad Direction"
            End
10          End If

        Cards(current).selected = Sel
        UpdateSel
    End Sub

15  Sub DisplayCard (index)
    'takes care of displaying menu on screen
    Dim depth As Integer 'number of visible cards
    Dim i As Integer 'counter
    Dim ancestor As Integer 'card numbers

20     current = index
    parent = Cards(current).parent
    depth = Cards(current).level

    'hide cards after (in front of) current
25     For i = MAXCARD To depth - 1 Step -1
        sspTitle(i).Visible = False
        sspCard(i).Visible = False
    Next i

    'make sure previous tab names are correct and visible
30     ancestor = current
    For i = depth - 1 To 1 Step -1
        ancestor = Cards(ancestor).parent
        sspTitle(i).Caption = Cards(ancestor).name
        sspCard(i).Visible = True
35         sspTitle(i).Visible = True
    Next i

    'show current card
    sspTitle(depth).Caption = Cards(current).name
    sspCard(depth).Visible = True
40     sspTitle(depth).Visible = True

    'show buttons on current card
    DisplayItems
End Sub

45  Sub DisplayItems ()
    'displays buttons on a card
    Dim Area As SSPanel
    Dim i As Integer
    Dim Dx, Dy, x, Y, w, h
50     Dim NItems As Integer

```

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```

NItems = Cards(current).NItems

5   Set Area = sspCard(Cards(current).level)'this is a pointer, not a copy
   'calculate size of button
   Dx = Area.Width * .9 / MAXCOLS
   Dy = Area.Height * .9 / MAXROWS
   w = Dx * .9
10  If w > 30 Then w = 30
   h = Dy * .9
   If h > 20 Then h = 20

   sspBlinkBG.Visible = False
   sspBlinkBG.ZOrder 0 'bring to front
15  'place and show each button
   For i = 1 To NItems
       sspItem(i).Width = w
       sspItem(i).Height = h
       sspItem(i).Caption = Cards(Cards(current).item(i)).name
       If Cards(Cards(current).item(i)).actionCode = actNONE Then
20         'turn inactive buttons grey
           sspItem(i).BackColor = greyCOLOR
       Else
           sspItem(i).BackColor = itemCOLOR
       End If
25  x = Area.Left + .05 * Area.Width + ((i - 1) Mod MAXCOLS) * Dx
   y = Area.Top + .05 * Area.Height + (Int((i - 1) / MAXCOLS) * .5) * Dy
   CenterItem sspItem(i), x, y
   sspItem(i).ZOrder 0
   sspItem(i).Visible = True
   Next i
30  'make blinker bigger than buttons
   CPlace 2, sspBlinkBG, sspItem(1)

   'hide unused buttons
   For i = NItems + 1 To MAXITEM
35     sspItem(i).Visible = False
   Next i
   UpdateSel
End Sub

Sub Form_Activate ()
40  'check for a return code from another form
   sspCont.Visible = False
   Select Case returnCode
       Case BACK
           If current < homeCARD Then current = lastCard
45           SetStatus "Use arrows and select or use keypad.", greyCOLOR
           DisplayCard current
           UpdateSel
       Case SHORTCUT
           current = homeCARD
           SetStatus "Use arrows and select or use keypad.", greyCOLOR
50           DisplayCard current

```

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```

UpdateSel
Case FILTER
  SetStatus "Use arrows and select or use keypad.", greyCOLOR
  If current < homeCARD Then
    DisplayCard current
  Else
    lastCard = current
    Select Case currDomain
      Case TV
        DisplayCard filterCARD
      Case MOVIE
        DisplayCard mfilterCARD
      Case SHOP
        DisplayCard current
    End Select
  End If
UpdateSel
Case COMING
  'to get from TV list view to schedule view
  Cards(current).selected = 2
  sameFilter = False
  Set views(currDomain) = frmComing
  returnCode = SHOWVIEW
  Me.Hide
End Select
End Sub

Sub Form_KeyDown (KeyCode As Integer, Shift As Integer)
  Dim index As Integer
  Dim n As Integer

  Select Case KeyCode
    Case 5_BACK
      'Go up in menu hierarchy
      Animate "Back", 0
    Case B_HELP
      InvokeHelp
    Case B_PREVIEW
      userStation = 1
      userStart = fakeTime
      returnCode = TOTV
      Me.Hide
    Case B_SELECT
      'Do button action
      ButtonAction
    Case B_RIGHT
      ChangeSel ("Right")
    Case B_LEFT
      ChangeSel ("Left")
    Case B_UP
      ChangeSel ("Up")
    Case B_DOWN
      ChangeSel ("Down")
    Case B_PAGEUP

```

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```

Case B_PAGEDOWN
'Use numeric key pad to choose a button directly, without navigation
Case B_1
5   If Cards(current).NItems > 0 Then
      Cards(current).selected = 1
      UpdateSel
      ButtonAction
    End If
Case B_2
10  If Cards(current).NItems > 1 Then
      Cards(current).selected = 2
      UpdateSel
      ButtonAction
    End If
Case B_3
15  If Cards(current).NItems > 2 Then
      Cards(current).selected = 3
      UpdateSel
      ButtonAction
    End If
20  Case B_4
      If Cards(current).NItems > 3 Then
        Cards(current).selected = 4
        UpdateSel
        ButtonAction
      End If
25  Case B_5
      If Cards(current).NItems > 4 Then
        Cards(current).selected = 5
        UpdateSel
        ButtonAction
      End If
30  Case B_6
      If Cards(current).NItems > 5 Then
        Cards(current).selected = 6
        UpdateSel
        ButtonAction
      End If
35  Case B_7
      If Cards(current).NItems > 6 Then
        Cards(current).selected = 7
        UpdateSel
        ButtonAction
      End If
40  Case B_8
      If Cards(current).NItems > 7 Then
        Cards(current).selected = 8
        UpdateSel
        ButtonAction
      End If
45  Case B_9
      If Cards(current).NItems > 8 Then
        Cards(current).selected = 9
        UpdateSel
50

```

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```

        ButtonAction
    End If
    Case B_0
        current = homeCARD
        DisplayCard current
    Case Asc("Q")
        End
    End Select
End Sub

10
Sub Form_Load ()
    'set fonts and colors
    sspCard(0).BackColor = backgroundCOLOR
    sspTitle(0).BackColor = backgroundCOLOR
    15 sspItem(0).BackColor = itemCOLOR
    sspBlinkBG.BackColor = highlightCOLOR
    sspItem(0).FontSize = mediumFONT
    sspCard(0).FontSize = mediumFONT
    sspTitle(0).FontSize = mediumFONT
    Me.BackColor = formCOLOR
    20 'fit into display area
    SizeAForm Me, dispTop, dispHeight, dispLeft, dispWidth
    Me.Scale (0, 0)-(100, 100)
    'set global return code to default
    returnCode = BACK
    25 'read in menu hierarchy for xolodex
    PopulateCards
    'load graphical objects
    LoadGraphics
    'set current card on screen
    DisplayCard homeCARD
    30 End Sub

Sub LoadGraphics ()
    Dim i As Integer 'counter
    Dim tabHeight

    35 'load buttons
    For i = 1 To MAXITEM
        Load sspItem(i)
    Next i

    40 'shape prototype card
    sspCard(0).Top = sspItem(0).Height
    sspCard(0).Height = 100 - CARDSHIFT - sspCard(0).Top
    sspCard(0).Left = 2 * CARDSHIFT
    sspCard(0).Width = 100 - 4 * CARDSHIFT
    45 'shape prototype tab
    sspTitle(0).AutoSize = False
    sspTitle(0).Width = sspCard(0).Width * MAXTITLE - CARDSHIFT
    'load and shape cards and tabs
    For i = 1 To MAXCARD
        Load sspCard(i)
        50 sspCard(i).Height = sspCard(i - 1).Height - CARDSHIFT
    Next i
End Sub
55

```

```

sspCard(i).Top = sspCard(i - 1).Top + CARDSHIFT
sspCard(i).ZOrder
Load sspTitle(i)
5 sspTitle(i).Top = sspCard(i).Top - sspTitle(0).Height + 2
Select Case (i Mod MAXTITLE)
Note: these cases are not flexible for different MAXTITLE
Case 1
sspTitle(i).Left = sspCard(i).Left
Case 2
10 sspTitle(i).Left = sspCard(i).Left - sspCard(i).Width / 2 -
sspTitle(i).Width / 2
Case 3
sspTitle(i).Left = sspCard(i).Left + sspCard(i).Width - sspTitle(i).Width
End Select
15 sspTitle(i).ZOrder
Next i
End Sub

```

```

Sub PopulateCards ()
This subroutine reads in the card data from the
20 'CARDFILE file defined as a constant. The cards
will be numbered 1 to the number of lines (cards)
in the file. All special cards should come before
the home card (by convention), and are named as
constants in the declarations. Each card record
25 should have a level (integer), item selected (integer),
a name (string), an info string (string), and
an action code (integer). If the action code is greater
than actNEXT, one additional input (variant type) is read
for the card.
Dim last As Integer, parent As Integer
30 Dim selected As Integer
Dim index As Integer, itemNo As Integer
Dim level, title, text, action
Open CARDFILE For Input As #1
make dummy parent for top level
35 index = 0
Cards(index).name = "root"
Cards(index).level = 0
Cards(index).NItems = 0
While Not EOF(1)
40 last = index
index = index + 1
Input #1, level, selected, title, text, action
Cards(index).level = level
Cards(index).selected = selected
45 Cards(index).name = title
Cards(index).infotext = text
Cards(index).actionCode = action
If action > actNEXT Then
Input #1, action
Cards(index).actionData = action
50 End If

```

```

Cards(index).NItems = 0 'initialize number of items
If Cards(index).level = Cards(last).level + 1 Then
    'Child of last
    parent = last
5    ElseIf Cards(index).level <= Cards(last).level Then
        'Sibling or cousin, back up to find parent
        Do While (Cards(index).level < Cards(last).level)
            'Find last sibling
            last = Cards(last).parent
10        Loop
        parent = Cards(last).parent
    Else 'Skipped a level, text file is incorrect
        MsgBox "Bad level in text file."
        Stop
    End
15    End If
    Cards(index).parent = parent
    'Add self to parent's list of items
    itemNo = Cards(parent).NItems + 1
    Cards(parent).NItems = itemNo
20    Cards(parent).item(itemNo) = index
    Cards(index).self = itemNo
Wend
Cards(0).NItems = 1
Close #1
25 End Sub

Sub tmrBlink_Timer ()
    BlinkControl.Visible = Not BlinkControl.Visible
End Sub

30 Sub ToggleTabs ()
    'toggles offset of tab placement; development only
    Dim i As Integer
    Static offset
    If offset = 3.5 Then
35        offset = 2
    Else
        offset = 3.5
    End If
    For i = 1 To 9
        sspTitle(i).Top = sspCard(i).Top - sspTitle(0).Height + offset
40    Next i
End Sub

Sub UpdateSel ()
    'put blinking highlight in correct location, update info bar
45    Dim i As Integer
    Dim x, y
    Dim S As SSPanel
    Dim text As String
    Dim color

50    BlinkStop False 'turn blinking off

```

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```

i = Cards(current).selected
If i > 0 Then 'something is selected
    Set S = sspItem(i) 'S is pointer to button
    'find center of butt n
    x = S.Left + S.Width / 2
    Y = S.Top + S.Height / 2
    'put blinker behind button
    CenterItem sspBlinkBG, x, Y
    'resume blinking
    BlinkStart sspBlinkBG, True
End If
text = Cards(Cards(current).item(Cards(current).selected)).infotext
color = sspItem(Cards(current).selected).BackColor
SetInfo text, color
End Sub

Sub Zoom (n As Integer, C As Control, Dest As Control)
'animates control C changing size to control Dest
    Dim i As Integer, j As Integer
    Dim dl, dw, dt, dh
    dl = (Dest.Left - C.Left) / n
    dw = (Dest.Width - C.Width) / n
    dt = (Dest.Top - C.Top) / n
    dh = (Dest.Height - C.Height) / n
    C.ZOrder
    C.AutoSize = False
    For i = 1 To n
        C.Move C.Left + dl, C.Top + dt, C.Width + dw, C.Height + dh
        C.Refresh
    Next i
End Sub

'===== SELECT form code =====
'This form is another attempt at alphabetic input that allows only valid input.
' It relies on the TV titles database which has two tables. The reference table is
used first
' and contains a count of all items starting with each letter of the alphabet or
with a
' symbol or number. The user is first presented with a list of possible starting
letters
' (each item in the first on-screen list may have several letters in it). Once a
starting
' letter is chosen, a snapshot is made of matching entries from the table of titles.
Each list the user sees has only valid choices for the next letter, or full titles
if
' a particular title is distinguished from all others by the letters chosen so far.
The best way to understand is to see the form in action before reading the code.
The code could easily be modified to work with other data such as lists of movies,
etc.
note: the non-proportional font used in the itemBoxes is Courier New
Option Explicit
Dim DB As database 'the full database

Dim list(1000) As String 'the list of selection strings

```

```

Dim leaf(1000) As Integer 'true if nth item is a leaf, false otherwise
Dim listEnd As Integer 'number of last element in list
Dim currPrefix As String 'the letters chosen so far
5 Dim initialList As Integer 'boolean 'true if this list has multiple letters per item
Dim BlinkControl As Control 'not used, currently no blinking object
Dim itemSelected As Integer 'from 1 to MAXDISPLAY
Dim locSelected As Integer 'from 1 to MAXLOC
Dim rowOffset 'difference between tops of two consecutive reduced items

10 'database
Dim allData As snapshot
Dim filterData As snapshot
Dim marker(100) As String 'bookmarks of each MAXDISPLAY items
Dim locStart(100) As Integer 'rItem index for start of locator

15 'display parameters
Const MAXDISPLAY = 6 'Number of items in close up
Dim MAXITEM As Integer 'Number of items in whole list
Dim MAXLOC As Integer 'Number of locator positions
Dim whichrItem(MAXDISPLAY) As Integer 'which rItems are in the current display
20 Const GAP = 10 'space around lists
Const EXTRA = 70 'room for longer programs
Const reducedEXTRA = 20 'room for longer programs in reduced rep
Const T = 50
Const H = 1000 - 2 * T
25 Const locL = 30 'for reduced list
Const locW = 100
Const dispL = locW + 2 * locL 'for display list
Const dispW = 1000 - dispL - locL

Sub BlinkStart (C As Control, vis)
30 Set BlinkControl = C
BlinkControl.Visible = vis
tmrBlink.Enabled = True
End Sub

35 Sub BlinkStop (vis)
tmrBlink.Enabled = False
If BlinkControl Is Nothing Then 'do nothing
Else
BlinkControl.Visible = True
End If
40 Set BlinkControl = Nothing
End Sub

Sub ChangeLoc (direct As String)
page up or down with the locator
45 Select Case direct
Case "Up"
If locSelected > 1 Then
locSelected = locSelected - 1
RedoDisplay
End If
50 Case "Down"

```

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```

        If locSelected < MAXLOC Then
            locSelected = locSelected + 1
            RedoDisplay
5       End If
    End Select
End Sub

Sub ChangeSel (direct As String)
    'Perform list navigation
10    Select Case direct
        Case "Up"
            If itemSelected > 1 Then
                'move up within items currently displayed
                itemSelected = itemSelected - 1
                selector.Top = itemBox(itemSelected).Top - GAP
                rItem(0).Top = locator.Top + rowOffset * (itemSelected - 1)
                SetItemInfo
            ElseIf locSelected > 1 Then
                'display previous section of the list
                itemSelected = MAXDISPLAY
                locSelected = locSelected - 1
                RedoDisplay
20            End If
        Case "Down"
            If itemSelected < MAXDISPLAY Then
                'move down within items currently displayed
                'do not move to select an empty item
                If (locSelected - 1) * MAXDISPLAY + itemSelected < MAXITEM Then
                    itemSelected = itemSelected + 1
                    selector.Top = itemBox(itemSelected).Top - GAP
                    rItem(0).Top = locator.Top + rowOffset * (itemSelected - 1)
30                SetItemInfo
                End If
            ElseIf locSelected < MAXLOC Then
                'display next section of list
                itemSelected = 1
                locSelected = locSelected + 1
                RedoDisplay
35            End If
        End Select
    End Sub

40    Sub DoSelect ()
        'finish with leaf value or create a new list based on user's choice of prefix
        Dim index As Integer
        Dim count As Integer
        Dim i As Integer
        Dim nextChar As String
        Dim looking As Integer 'boolean
        Dim title As String

        index = locStart(locSelected) + itemSelected - 1 'index in list of item
        selected
50        If leaf(index) Then

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```

'sel ction made; show next view
title = removeAmpersand(list(index))
filterData.FindFirst "SelectTitle = '" & title & "'"
5   If filterData.NoMatch Then
    Do 'prompt for different title until found
        'note: this should never happen. it's only in the list if it's in the
database
        title = InputBox(title & " not found. Enter new title:", title)
        filterData.FindFirst "SelectTitle = '" & title & "'"
10   Loop Until Not filterData.NoMatch
    End If
    userString = filterData("FullTitle")
    Set views(TV) = frmWeek
    sameFilter = False
    returnCode = SHOWVIEW
15   Me.Hide
Else
    'indicate to user that something is happening
    itemBox(itemSelected).BackColor = greyCOLOR
    SetInfo "Loading data, please wait...", greyCOLOR
20   DoEvents
    i = Len(list(index))
    currPrefix = ""
    If initialList Then
        currPrefix = list(index)
25   Else
        'remove underline formatting (&) from prefix
        If i > 2 Then currPrefix = Left(list(index), i - 2)
        currPrefix = currPrefix & Right(list(index), 1)
    End If
    SetStatus "TV Titles starting with '" & currPrefix, greyCOLOR
30   'construct new list
    If initialList Then
        'list items are special, not prefixes
        If index = 1 Then
            'Symbol or Number selected
            initialList = False
            filterData.Filter = "SelectTitle < 'A'"
            currPrefix = ""
35   Else
            'a list of letters selected
            listEnd = 0
            For i = 1 To Len(currPrefix)
                'strip out the letters (ignore commas) to make a new list
                If Mid(currPrefix, i, 1) >= "A" Then
                    listEnd = listEnd + 1
                    list(listEnd) = "&" & Mid(currPrefix, i, 1)
45   leaf(i) = False
                End If
            Next i
        End If
    End If
Else
    'refilter data to match the new prefix
50   filterData.Filter = "SelectTitle like '" & currPrefix & "'"

```

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```

End If

'data assumed to be already sorted
5 If Not initialList Then
  'still need to creat new list from data
  Set filterData = filterData.CreateSnapshot()
  filterData.MoveFirst
  listEnd = 0
  For i = Asc(" ") To Asc("Z") 'space, punctuation, and letters
10 'note: should be fixed up by not trying every single one, go stright to
    next db item's char
    count = 0: looking = True
    While Not filterData.EOF And looking
      nextChar = Mid(filterData("SelectTitle"), Len(currPrefix) + 1,
15 1)
      If nextChar = Chr(i) Or nextChar = LCase(Chr(i)) Then
        count = count + 1
        filterData.MoveNext
      Else
        looking = False
20 End If
    Wend
    Select Case count
      Case 0 'do not add to list
      Case 1 'make a leaf entry
25 filterData.MovePrevious
        listEnd = listEnd + 1
        list(listEnd) = fixAmpersand((filterData("SelectTitle")))
        leaf(listEnd) = True
        filterData.MoveNext
      Case Else 'make a non-leaf entry
30 filterData.MovePrevious
        listEnd = listEnd + 1
        list(listEnd) = currPrefix & "&" & Chr(i) 'underline new char
        'note: underlining is just one mechanism for emphasizing what is
different
35 leaf(listEnd) = False
        filterData.MoveNext
    End Select
  Next i
  If filterData.RecordCount <= MAXDISPLAY Then
40 'redo the list to have just leaves in it, if they all fit in one
    display
    listEnd = 0
    filterData.MoveFirst
    While Not filterData.EOF
      listEnd = listEnd + 1
45 list(listEnd) = fixAmpersand((filterData("SelectTitle")))
      leaf(listEnd) = True
      filterData.MoveNext
    Wend
  End If
50 End If

```

55

```

        'display the newly created list
        itemBox(itemSelected).BackColor = itemCOLOR 'restore itemBox color
        initialList = False
        If ListEnd > 1 Then
5           NewList
        Else
            'automatically select item if only one in list
            locSelected = 1
            itemSelected = 1
10           DoSelect
        End If
    End If
End Sub

15 Sub Form_Activate ()
    'always begin with initial list
    LoadData
    NewList
End Sub

20 Sub Form_KeyDown (KeyCode As Integer, Shift As Integer)
    Select Case KeyCode
        Case Asc("Q")
            End
        Case B_BACK
            'note: do we want ability to back up one level from a particular choice in
25 the list?
            ' Could have B_BACK go back one list then back to menu after another press.
            returnCode = BACK
            Me.Hide
        Case B_HELP
            InvokeHelp
30         Case B_PREVIEW
        Case B_SELECT
            DoSelect
        Case B_UP
            ChangeSel ("Up")
35         Case B_DOWN
            ChangeSel ("Down")
        Case B_RIGHT
        Case B_LEFT
        Case B_PAGEUP
            ChangeLoc ("Up")
40         Case B_PAGEDOWN
            ChangeLoc ("Down")
        Case B_FILTER
        Case B_G
            returnCode = SHORTCUT
45         Me.Hide
    End Select
End Sub

Sub Form_Load ()
50     Dim i As Integer 'counter

```

55

```

Dim itemRoom

'set colors and fonts
5  it mBox(0).FontSize = largeFONT
   rightArrow(0).FontSize = largeFONT
   rItem(0).BackColor = itemCOLOR
   selector.FillColor = highlightCOLOR
   displayList.FillColor = backgroundCOLOR
   locator.FillColor = backgroundCOLOR
10  itemBox(0).BackColor = itemCOLOR
   rightArrow(0).BackColor = itemCOLOR
   shpSlot.BorderColor = slotCOLOR
'size and place the objects to the screen
   SizeAForm Me, DispTop, DispHeight, DispLeft, DispWidth
15  Me.Scale (0, 0)-(1000, 1000)
   SizeAControl locator, T - GAP, H + GAP, locL - GAP, locW + 2 * GAP
   SizeAControl shpSlot, T, H, locL + reducedEXTRA, locW - 2 * reducedEXTRA
   SizeAControl displayList, T - GAP, H + GAP, dispL, dispW
   locator.ZOrder
   shpSlot.ZOrder
20  rItem(0).ZOrder
   itemRoom = H / MAXDISPLAY
   SizeAControl itemBox(0), T + (.5 * GAP), itemRoom - GAP, dispL + EXTRA, dispW -
2 * EXTRA
   SizeAControl leftArrow(0), T + (.5 * GAP), itemRoom - GAP, dispL, EXTRA
25  SizeAControl rightArrow(0), T + (.5 * GAP), itemRoom - GAP, dispL - dispW -
EXTRA, EXTRA
   SizeAControl selector, T, itemRoom + GAP, dispL, dispW
   selector.ZOrder
   For i = 1 To MAXDISPLAY
30     Load itemBox(i)
     itemBox(i).Visible = False
     itemBox(i).Top = itemBox(0).Top + (i - 1) * itemRoom
     Load rightArrow(i)
     rightArrow(i).Top = itemBox(i).Top
   Next i
35 End Sub

Sub LoadData ()
   Dim refSnap As snapshot
   Const MAXTOGETHER = MAXDISPLAY 'number of letter allowed in one itemBox
   Dim together

40   'fill initial selection list
   listEnd = 0
   Set DB = OperDatabase(TVTitles)
   Set allData = DB.CreateSnapshot("Titles")
45   'create initial list
   Set refSnap = DB.CreateSnapshot("Reference")
   refSnap.MoveFirst
   together = MAXTOGETHER 'indicate need for new item
   While Not refSnap.EOF
50     Select Case refSnap("Number")

```

55

```

Case 0
  'do not add to list
Case 1
  'make a leaf entry
  listEnd = listEnd + 1
  allData.FindFirst "SelectTitle Like " & refSnap("Letter") & ""
  list(listEnd) = allData("SelectTitle")
  leaf(listEnd) = True
  together = MAXTOGETHER
Case Else
  If refSnap("Letter") = "#" Then
    listEnd = listEnd + 1
    list(listEnd) = "Symbol or Number"
    together = MAXTOGETHER
    'note: DoSelect relies on this entry being the first list item
  Else
    If together >= MAXTOGETHER Then
      listEnd = listEnd + 1
      list(listEnd) = refSnap("Letter")
      together = 1
    Else
      list(listEnd) = list(listEnd) & ", " & refSnap("Letter")
      together = together + 1
    End If
  End If
  leaf(listEnd) = False
End Select
refSnap.MoveNext
Wend
Set filterData = allData
initialList = True
End Sub

Sub NewList ()
  'remakes the display for a new list
  'note: should itemSelected be initialized to something other than 1?
  Dim i As Integer 'counter
  Dim section As Integer 'count the number of locator locations
  Dim msg As String

  'clear captions
  For i = 1 To MAXDISPLAY
    itemBox(i).Caption = ""
  Next i

  For i = 1 To MAXITEM
    Unload rItem(i)
  Next i

  MAXITEM = listEnd 'number of items in list

  'load the reduced item shapes and size relative to MAXITEM
  rowOffset = (H - rItem(0).Height) / MAXITEM
  If rowOffset > rItem(0).Height + GAP Then rowOffset = rItem(0).Height + GAP

```

```

rItem(0).Visible = False
rItem(0).Top = T
rItem(0).Left = locL + reducedEXTRA
5 rItem(0).Width = locW - 2 * reducedEXTRA
rItem(0).BackColor = itemCOLOR
filterData.MoveFirst
'size and place the item shapes
'and set section bookmarks
section = 0 'number of locator locations
10 For i = 1 To MAXITEM
    Load rItem(i)
    rItem(i).Top = T + (i - 1) * rowOffset
    If ((i - 1) Mod MAXDISPLAY) = 0 Then
        'begin a new locator location
15         section = section + 1
        locStart(section) = i
    End If
    If Not leaf(i) Then
        rItem(i).Width = rItem(i).Width + reducedEXTRA
20    End If
    rItem(i).ZOrder
    rItem(i).Visible = True
Next i
MAXLOC = section
locStart(section + 1) = MAXITEM + 1
25
'set length of minselector
'use rItem(0) as mini selector
rItem(0).Left = locL - GAP
rItem(0).Width = locW - 2 * GAP
30
'initialize selector and locator
itemSelected = 1
locSelected = 1
rItem(0).BackColor = highlightCOLOR
35
'set the captions in the itemBoxes
RedoDisplay
End Sub

Sub RedoDisplay ()
'set the captions in the itemBoxes to correspond to items in locator
40 'reposition locator, selector and set item info in info box

Dim last As Integer 'number of last item in display
Dim i As Integer 'counter
Dim index As Integer 'index of item in list
45
index = locStart(locSelected)
For i = 1 To MAXDISPLAY
    If index > MAXITEM Then
        'hide empty itemBox
50         itemBox(i).Caption = ""
        itemBox(i).Visible = False
    End If
    index = index + 1
Next i

```

55

```

        rightArrow(i).Visible = False
    Else
        itemBox(i).Caption = list(index)
5       If Not leaf(index) Then
            'show right arrow and put in all caps
            rightArrow(i).Visible = True
            itemBox(i).Caption = UCase(list(index))
        Else
            rightArrow(i).Visible = False
10        End If
        itemBox(i).Visible = True
        last = i 'remember last valid selection
        index = index + 1
    End If
15    Next i

    'Do not allow blank to be selected
    If itemSelected > last Then
        itemSelected = last
    End If
20

    'fix the rest of the display
    displayList.Height = H + 2 * GAP - (H / MAXDISPLAY * (MAXDISPLAY - last))
    selector.Top = itemBox(itemSelected).Top - GAP
    locator.Top = T + rowOffset * (locStart(locSelected) - 1)
25    locator.Height = last * rowOffset + rItem(0).Height - rowOffset
    rItem(0).Top = locator.Top + rowOffset * (itemSelected - 1)
    rItem(0).Visible = True
    SetItemInfo
End Sub

30    Function removeAmpersand (oldText As String) As String
        'for each double ampersand, remove one of them
        Dim text As String
        Dim newText As String
        Dim i As Integer
35
        text = oldText
        newText = ""
        While InStr(text, "&&")
            i = InStr(text, "&&")
            newText = newText & Left(text, i)
40            text = Right(text, Len(text) - (i + 1))
        Wend
        removeAmpersand = newText & text
    End Function

45    Sub SetItemInfo ()
        'put the relevant info for current item into info box
        Dim msg As String
        Dim index As Integer
        Dim F As snapshot
50
        If Me.Visible Then

```

55

```

        index = locStart(locSelected) - itemSelected - 1
        If leaf(index) Then
            'get full titl from data
5           Set F = filterData
            F.FindFirst "SelectTitle = '" & list(index) & "'"
            msg = F("FullTitle")
        Else
            msg = "Titles beginning with '" & list(index) & "'"
10        End If
        SetInfo msg, (itemBox(itemSelected).BackColor)
    End If
End Sub

Sub tmrBlink_Timer ()
15    BlinkControl.Visible = Not BlinkControl.Visible
End Sub

'===== START form code =====
'This startup form allows the developer to choose display mode
' (either for PC, TV, or mini PC for making screen prints)
' then starts the actual program by calling Main
20 Option Explicit

Sub Form_Load ()
    returnCode = STARTUP
25 End Sub

Sub miniButton_Click ()
    displayMode = "mini"
    Unload Me
    Main
30 End Sub

Sub PCbutton_Click ()
    displayMode = "PC"
    Unload Me
    Main
35 End Sub

Sub TVbutton_Click ()
    displayMode = "TV"
    Unload Me
    Main
40 End Sub

'===== TV form code =====
'This form pretends to show a TV program or record it, if it is not currently on
45 Option Explicit

Const GAP = 700

Sub Form_Activate ()
50    Dim msg As String

```

55

```

Dim DB As database
Dim Programs As tabl
Dim startTS
Dim refSnap As snapshot
5 Dim refDate
Dim startTS, finishTS, nowTS

Set DB = OpenDatabase(TVDB)
Set refSnap = DB.CreateSnapshot("Reference")
10 refSnap.FindFirst "Name = 'Date'"
refDate = DateValue(refSnap("Data"))
Set Programs = DB.OpenTable("Programs")
Programs.Index = "ID"
Programs.Seek "=", userStation, userStart
'note: ought to check that userStation is valid
15 If Programs.NoMatch Then
    'simulate showing whatever is currently on userStation
    nowTS = DateDiff("n", refDate, fakeToday + fakeTime) \ 30
    Set refSnap = Programs.CreateSnapshot()
    refSnap.FindFirst "Station = " & Str(userStation)
    refSnap.FindNext "FinishTS > " & Str(nowTS)
20 msg = "You are watching "
    msg = msg & Chr(13) & Format(refSnap("Title"))
    msg = msg & " on " & StationString(refSnap("Station"))
    msg = msg & Chr(13) & Format(refSnap("Start"), "h:mm AM/PM")
    msg = msg & " to " & Format(refSnap("Finish"), "h:mm AM/PM")
25 Else
    'decide if the program is on, record if it's not
    startTS = DateDiff("n", refDate, Programs("Start")) \ 30
    finishTS = DateDiff("n", refDate, Programs("Finish")) \ 30
    nowTS = DateDiff("n", refDate, fakeToday - fakeTime) \ 30
    'nowTS would be calculated to work in real time
30 If startTS <= nowTS And finishTS >= nowTS Then
        msg = "You are watching "
    Else
        msg = "The VCR is set to record "
    End If
35 msg = msg & Chr(13) & Format(Programs("Title"))
    msg = msg & " on " & StationString(Programs("Station"))
    msg = msg & Chr(13) & Format(Programs("Start"), "h:mm AM/PM")
    msg = msg & " to " & Format(Programs("Finish"), "h:mm AM/PM")
End If
40 textArea.Caption = msg
End Sub

Sub Form_KeyDown (KeyCode As Integer, Shift As Integer)
    Select Case KeyCode
    Case B_BACK
45         returnCode = LASTVIEW
        'note: this is not appropriate if we came from menu (rolodex)
        Me.Hide
    Case B_0
50         returnCode = SHORTCUT
        Me.Hide
55

```



```

        Case Asc("Q")
            End
        Case Els
5         returnCode = BACK
            Me.Hide
        End Select
    End Sub

10 Sub Form_Load ()
    textArea.Caption = ""
    textArea.FontSize = largeFONT
    SizeAForm Me, 0, ScrHeight, 0, ScrWidth
    SizeAControl textArea, GAP, ScrHeight - 2 * GAP, GAP, ScrWidth - 2 * GAP
    End Sub

15 '==== TV_GUIDE form code =====
'General remarks:
    The Main procedure starts the ball rolling by showing the Frame, loading
    all the forms, and then showing the rolodex menu. Control is transferred from form
    to form through the use of the returnCode variable (see list of return codes in
20 'global declarations). The frmDex, for example, sets the returnCode to SHOWVIEW, and
    hides itself. This causes frmFrame to become active. frmFrame looks at the
    returnCode
    and shows the current domain's view form. Communication between forms is done
    through
25 'a variety of variables, since a form's procedures are not accessible from outside.

Option Explicit
'.....
'    Global Declarations
'.....

30 'database constants
Global Const CARDFILE = "c:\pctv\db\cards2.txt"
Global Const MVDB = "c:\pctv\db\plots.mdb"
Global Const SPDB = "c:\pctv\db\shopping.mdb"
Global Const TVDB = "c:\pctv\db\big.mdb"
35 Global Const TVTitles = "c:\pctv\db\titles.mdb"
Const CATDB = "c:\pctv\db\cats.mdb"
Dim typeTable As table 'TV type IDs
Dim catTable As table 'TV category IDs
Dim statTable As table 'station IDs
Global fakeToday 'keep the day constant
40 Global fakeTime 'keep the time constant
Global displayMode As String 'display set for "PC" or "TV" (affects size of fonts
and graphics)
Global newUser As Integer 'boolean 'when true, give extra helps

45 Global ScrWidth, ScrHeight
Global DispTop, DispHeight, DispLeft, DispWidth 'display area available to forms
inside the frame

'Colors
Global Const highlightCOLOR = &H8C80FF 'redish
50 Global Const backgroundCOLOR = &H80FFFF 'yellow

```

55

```

Global Const itemCOLOR = &HFFFFFF0    'light blue
Global Const formCOLOR = &HFF0000    'dark blue
Global Const whiteCOLOR = &H80000005  'white
Global Const greyCOLOR = &HC0C0C0    'grey
5   Global Const blackCOLOR = &H0&    'black
Global Const slotCOLOR = &H80000005  'white
Global Const borderCOLOR = &HFF&    'red
Global Const divideCOLOR = &HFFFF&  'white
Global Color(10) 'array filled in Main
10  '
    'font sizes
Global Const smallFONT = 13.8
Global Const mediumFONT = 18
Global Const largeFONT = 24

15  'domain constants
Global Const MOVIE = 0
Global Const TV = 1
Global Const SHOP = 2

20  'array of list forms
Global listFrm(3) As Form
Global TVlist As New frmList
Global MOVlist As New frmList
Global SHOPlist As New frmList

25  .....
    ' Inter-Form Communication
    .....
Global currDomain As Integer 'the current domain
Global filters(3) As String 'array of query strings for current domain filter
30  Global currFilter(3) As String 'text name of filter
Global currView(3) As String 'text name of current view (use mainly for lists which
    change view title)
Global views(3) As Form 'array of current domain views (TV coming or TV schedule,
    for instance)
Global viewFilter As String 'the database filter needed to obtain the appropriate
35  view
    'note: used only for movies at this time, would probably be expanded to array
Global userString As String 'string chosen by user
Global userMsg 'message string to display to user
Global userStation 'a station selected by user
40  Global userStart 'a time chosen by user

Global sameFilter As Integer 'boolean 'true if need to refilter data
Global sameView As Integer 'boolean 'true if need to redo display

'return codes determine which action to take on re-activate of frmFrame or frmDex
45  Global returnCode As Integer
Global Const BACK = 0
Global Const TOTV = 1
Global Const LASTVIEW = 2
Global Const SHORTCUT = 3
50  Global Const DONE = 4

```

```

Global Const FILTER = 5
Global Const COMING = 6
Global Const SHOWVIEW = 9
5 Global Const ALPHA = 10
Global Const PICK = 11
Global Const STARTUP = 12

.....
' Define Type Card
10 ' for rolodex
.....
Global Const MAXITEM = 9 'max number of buttons on a card

'Represents one index card as viewed on screen
Type Card
15 self As Integer 'item number of self on parent
level As Integer 'number of cards away from root
name As String 'text to appear on button/card
infotext As String 'text for info bar
actionCode As Integer 'code for action to take when chosen
20 actionData As String 'extra info needed for action
parent As Integer 'number of parent card
Nitems As Integer 'number of buttons visible on card
Item(MAXITEM) As Integer 'array of card pointers (one for each button on card)
selected As Integer 'the number of the selected button
25 End Type

'Array of up to MAXCARDS index cards
Global Const MAXCARDS = 1000
Global Cards(MAXCARDS) As Card

30 .....
' Remote Buttons
.....
'assigned values in sub SetKeys
Global B_BACK
Global B_HELP
35 Global B_PREVIEW
Global B_UP
Global B_DOWN
Global B_LEFT
Global B_RIGHT
40 Global B_SELECT
Global B_PAGEUP
Global B_PAGEDOWN
Global B_1
Global B_2
45 Global B_3
Global B_4
Global B_5
Global B_6
Global B_7
Global B_8
50 Global B_9

```

55

Global B\_0  
Global B\_FILTER

5 .....  
'       COLORS  
.....

Global Const RED = &HFF&  
Global Const ORANGE = &H80FF&  
Global Const YELLOW = &HFFFF&  
10 Global Const GREEN = &H80FF60  
Global Const TURQUOISE = &HFFFFFFC  
Global Const BLUE = &HFF000C  
Global Const VIOLET = &HFF00FF  
Global Const WHITE = &HFFFFFFF  
15 Global Const BLACK = &H0&  
Global Const GREY = &HC0C0CC

.....  
'       CONSTANTS FROM VISUAL BASIC FILES       \*  
.....

20 .. From CONSTANT.TXT

' Key Codes  
Global Const KEY\_LBUTTON = &H1  
Global Const KEY\_RBUTTON = &H2  
25 Global Const KEY\_CANCEL = &H3  
Global Const KEY\_MBUTTON = &H4       ' NOT contiguous with L & RBUTTON  
Global Const KEY\_BACK = &H8  
Global Const KEY\_TAB = &H9  
Global Const KEY\_CLEAR = &HC  
30 Global Const KEY\_RETURN = &HD  
Global Const KEY\_SHIFT = &H10  
Global Const KEY\_CONTROL = &H11  
Global Const KEY\_MENU = &H12  
Global Const KEY\_PAUSE = &H13  
Global Const KEY\_CAPITAL = &H14  
35 Global Const KEY\_ESCAPE = &H1B  
Global Const KEY\_SPACE = &H20  
Global Const KEY\_PRIOR = &H21  
Global Const KEY\_NEXT = &H22  
Global Const KEY\_END = &H23  
40 Global Const KEY\_HOME = &H24  
Global Const KEY\_LEFT = &H25  
Global Const KEY\_UP = &H26  
Global Const KEY\_RIGHT = &H27  
Global Const KEY\_DOWN = &H28  
45 Global Const KEY\_SELECT = &H29  
Global Const KEY\_PRINT = &H2A  
Global Const KEY\_EXECUTE = &H2B  
Global Const KEY\_SNAPSHOT = &H2C  
Global Const KEY\_INSERT = &H2D  
Global Const KEY\_DELETE = &H2E  
50 Global Const KEY\_HELP = &H2F

55

' KEY\_A thru KEY\_Z are the same as their ASCII equivalents: 'A' thru 'Z'  
 ' KEY\_0 thru KEY\_9 are the same as their ASCII equivalents: '0' thru '9'

```

5  Global Const KEY_NUMPAD0 = &H60
    Global Const KEY_NUMPAD1 = &H61
    Global Const KEY_NUMPAD2 = &H62
    Global Const KEY_NUMPAD3 = &H63
    Global Const KEY_NUMPAD4 = &H64
10  Global Const KEY_NUMPAD5 = &H65
    Global Const KEY_NUMPAD6 = &H66
    Global Const KEY_NUMPAD7 = &H67
    Global Const KEY_NUMPAD8 = &H68
    Global Const KEY_NUMPAD9 = &H69
15  Global Const KEY_MULTIPLY = &H6A
    Global Const KEY_ADD = &H6B
    Global Const KEY_SEPARATOR = &H6C
    Global Const KEY_SUBTRACT = &H6D
    Global Const KEY_DECIMAL = &H6E
    Global Const KEY_DIVIDE = &H6F
20  Global Const KEY_F1 = &H70
    Global Const KEY_F2 = &H71
    Global Const KEY_F3 = &H72
    Global Const KEY_F4 = &H73
    Global Const KEY_F5 = &H74
    Global Const KEY_F6 = &H75
25  Global Const KEY_F7 = &H76
    Global Const KEY_F8 = &H77
    Global Const KEY_F9 = &H78
    Global Const KEY_F10 = &H79
    Global Const KEY_F11 = &H7A
    Global Const KEY_F12 = &H7B
30  Global Const KEY_F13 = &H7C
    Global Const KEY_F14 = &H7D
    Global Const KEY_F15 = &H7E
    Global Const KEY_F16 = &H7F
35  Global Const KEY_NUMLOCK = &H90

```

Function CategoryString (typeCode As Integer, catCode As Integer) As String  
 'creates user-readable string for a TV program's category

```

40  Dim msg As String

    msg = "Category: "
    'look up type code
    typeTable.Index = "ID"
    typeTable.Seek "=", typeCode
45  If typeTable.NoMatch Then
        msg = msg & typeCode
    Else
        msg = msg & typeTable("Name")
    End If
50  msg = msg & ", " 'all on one line, replaced: Chr(13) & "Subcategory: "

```

55

```

        'look up category code
        catTable.Index = "ID"
        catTable.Seek "=", catCode
5       If catTable.NoMatch Then
            msg = msg & catCod
        Else
            msg = msg & catTable("Name")
        End If
        CategoryString = msg
10      End Function

Sub CCopy (Cfrom As Control, Cto As Control)
    'copies attributes of Cfrom control to Cto
    Cto.Caption = Cfrom.Caption
    Cto.BackColor = Cfrom.BackColor
15     Cto.Top = Cfrom.Top
    Cto.Height = Cfrom.Height
    Cto.Left = Cfrom.Left
    Cto.Width = Cfrom.Width
    Cto.FontSize = Cfrom.FontSize
20     End Sub

Sub CenterItem (Item As Control, x, y)
    'centers a control around a point
    Item.Left = x - Item.Width / 2
    Item.Top = y - Item.Height / 2
25     End Sub

Sub CPlace (extra, Cfrom As Control, Cto As Control)
    'place Cfrom in the same place as Cto, with difference extra
    Cfrom.Top = Cto.Top - extra
30     Cfrom.Left = Cto.Left - extra
    Cfrom.Height = Cto.Height + 2 * extra
    Cfrom.Width = Cto.Width + 2 * extra
    End Sub

35     Function DayString (d, length As String) As String
        'returns string for appropriate day of week based on date given
        ' and length specified
        Select Case Weekday(d)
            Case 1
                If length = "long" Then
40                     DayString = "Sunday"
                Else
                    DayString = "Sun"
                End If
            Case 2
                If length = "long" Then
45                     DayString = "Monday"
                Else
                    DayString = "Mon"
                End If
            Case 3
50                 If length = "long" Then

```

55

```

        DayString = "Tuesday"
    Else
        DayString = "Tue"
    End If
5
    Case 4
        If length = "long" Then
            DayString = "Wednesday"
        Else
            DayString = "Wed"
10
        End If
    Case 5
        If length = "long" Then
            DayString = "Thursday"
        Else
            DayString = "Thur"
15
        End If
    Case 6
        If length = "long" Then
            DayString = "Friday"
        Else
            DayString = "Fri"
20
        End If
    Case 7
        If length = "long" Then
            DayString = "Saturday"
        Else
25
            DayString = "Sat"
        End If
    End Select
End Function

30
Function fixAmpersand (text As String)
    'put in a "&&" for every "&" so ampersand will print instead of format an underline
    Dim i As Integer
    Dim oldText As String
    Dim newText As String

35
    newText = ""
    oldText = text
    While InStr(oldText, "&")
        i = InStr(oldText, "&")
        newText = Left(oldText, i - 1) & "&&"
40
        oldText = Right(oldText, Len(oldText) - i)
    Wend
    fixAmpersand = newText & oldText
End Function

45
Sub InvokeHelp ()
    'add parameter for current location or give each form a local InvokeHelp
    'would be specialized for each view, probably not each button
    TellUser "Press Help (?) again for general help, or press any button on the
    remote for help with that button."
    Select Case returnCode
50
        Case B_HELP

```

55

```

    TellUser "General Help:"
    Case B_PREVIEW
        TellUser "Use the Preview button to see a video preview of the highlighted
5      selection."
    Case B_BACK
        TellUser "Use the Back button to back up to the previous screen."
    Case KEY_ESCAPE
        TellUser "Use the Shortcut key to get to the shortcut buttons."
    Case B_SELECT
10      TellUser "Use the select button to choose a highlighted option."
    Case Else
        TellUser "This help screen is not written yet."
    End Select
End Sub

15 Sub Main ()
    Dim i As Integer
    Dim DB As database
    Set DB = OpenDatabase(CATDB)
    Set typeTable = DB.OpenTable("Type")
20    Set catTable = DB.OpenTable("Category")
    Set DB = OpenDatabase(TVDB)
    Set statTable = DB.OpenTable("Stations")
    SetKeys displayMode
    'set different list forms
    Set listFrm(TV) = TVlist
25    Set listFrm(MOVIE) = MOVlist
    Set listFrm(SHOP) = SHOPlist
    'set color array
    Color(0) = &HBF8FC0 'teal green
    Color(1) = &HFFFF80 'light blue
30    Color(2) = &HFFC0FF 'light pink
    Color(3) = &HFF80FF 'dark pink
    Color(4) = &H80C0FF 'medium orange
    Color(5) = &HC0FFC0 'lightest green
    Color(6) = &HFF8080 'royal blue
35    Color(8) = &HFFC0C0 'lavendar
    Color(7) = &HC0C0& 'ochre
    'set date and time
    fakeToday = CDate("6/12/94")
    fakeTime = CDate("6:30 PM")

40    newUser = True

    'start up the forms
    frmFrame.Show
    DoEvents
    'load all forms here
45    Load frmDex
    Load frmAlpha
    Load frmTV
    Load frmMsg
    'Movie forms
50    currDomain = MOVIE

```

55



```

viewFilter = "Year >= 1993"
currView(MOVIE) = "Recent Movies"
currFilter(MOVIE) = ": All Categories"
5  SetStatus "Movies", greyCOLOR
   Load listFrm(MOVIE)
   'Shopping forms
   currDomain = SHOP
   filters(SHOP) = ""
10  SetStatus "Shopping, compact disks", greyCOLOR
   Load listFrm(SHOP)
   'TV forms
   currFilter(TV) = "Basketball"
   currDomain = TV
   filters(TV) = "Category = 39"
15  userString = "Nova"
   'Load frmWeek
   'Load listFrm(TV)
   'Load frmComing
   'Load frmWkday
   'Load frmSelect
20
   'show main menu
   SetStatus "Use arrows and select or use keypad.", greyCOLOR
   frmDex.Show
End Sub

25 Function Overlap (beginTS, endTS) As String
   'create query string to look for TV programs in the range between
   ' and including beginTS and endTS
   Overlap = "(StartTS <= " & Str(endTS) & " And FinishTS >= " & Str(beginTS) & ")"
30 End Function

Sub SetInfo (text As String, Color)
   'update the info box text and color
   Dim s As SSPanel
   Set s = frmFrame!sspInfo 'works as long as form is loaded
35   s.BackColor = Color
   s.Caption = text
End Sub

Sub SetKeys (mode As String)
   'Set the keymappings for keyboard or "remote"
40   B_1 = KEY_NUMPAD7
   B_2 = KEY_NUMPAD8
   B_3 = KEY_NUMPAD9
   B_4 = KEY_NUMPAD4
   B_5 = KEY_NUMPAD5
45   B_6 = KEY_NUMPAD6
   B_7 = KEY_NUMPAD1
   B_8 = KEY_NUMPAD2
   B_9 = KEY_NUMPAD3
   If mode = "TV" Then
50     'use keypad for all buttons (except 1-9)
     B_BACK = KEY_SUBTRACT
55

```

```

    B_HELP = 13 'I don't know what the name of this key is
    B_PREVIEW = KEY_ADD
    B_UP = Asc("8")
5    B_DOWN = Asc("2")
    B_LEFT = Asc("4")
    B_RIGHT = Asc("6")
    B_SELECT = Asc("5")
    B_PAGEUP = KEY_DIVIDE
10    B_PAGEDOWN = Asc("0")
    B_0 = KEY_MULTIPLY
    B_FILTER = KEY_RETURN
Else
    B_BACK = KEY_F1
    B_HELP = KEY_F3
15    B_PREVIEW = KEY_F2
    B_UP = KEY_UP
    B_DOWN = KEY_DOWN
    B_LEFT = KEY_LEFT
    B_RIGHT = KEY_RIGHT
20    B_SELECT = KEY_RETURN
    B_PAGEUP = KEY_PRIOR
    B_PAGEDOWN = KEY_NEXT
    B_0 = KEY_NUMPAD0
    B_FILTER = KEY_F4
End If
25 End Sub

Sub SetStatus (text As String, Color)
'update the status bar with new message
    Dim s As SSPanel
    Set s = frmFrame!sspStatus '(works as long as form is loaded)
30    s.BackColor = Color
    s.Caption = text
End Sub

Sub SizeAControl (Item As Control, t, H, l, w)
35 'set the size attributes of a control
    Item.Top = t
    Item.Left = l
    Item.Height = H
    Item.Width = w
40 End Sub

Sub SizeAForm (frm As Form, t, H, l, w)
'set the size attributes of a form
    frm.Top = t
    frm.Left = l
45    frm.Height = H
    frm.Width = w
End Sub

Function StationString (s) As String
50 'looks up station number and returns station name as string
    statTable.Index = "ID"

```

55

```

statTable.Se k "=", s
If statTable.NoMatch Then
    MsgBox "illegal station ID " & s
5    Stop
End If
StationString = statTable("Name")
End Function

10 Sub TellUser (message As String)
    'displays message on screen until key is pressed
    'probably would not be used
    userMsg = message
    Wait frmMsg
End Sub

15 Function TimeLabel (t) As String
    'returns null string for times on half hour.
    ' returns hour 1..12 otherwise
    Dim s As String
    s = Format(t, "hh:mm AM/PM")
20    If Mid(s, 4, 2) = "30" Then
        TimeLabel = ""
    Else
        s = Format(s, "h AM/PM")
        'strip off AM/PM
        TimeLabel = Left(s, Len(s) - 3)
25    End If
End Function

Function TimeString (aDate) As String
    'format a date as 12-hour time without AM/PM or leading zero
30    Dim theTime As String
    theTime = Format(aDate, "hh:mm AM/PM")
    theTime = Left(theTime, 5) 'take just "hh:mm" part
    If Left(theTime, 1) = "0" Then
        theTime = Right(theTime, 4)
35    End If
    TimeString = theTime
End Function

Sub Wait (F As Form)
    'Allows one form to wait for another to hide itself
40    F.Show
    While (F.Visible)
        DoEvents
    Wend
End Sub

45 '===== WEEK form code =====
Option Explicit
'stacked channel' view to be used with TV search and
' possibly other minimal searches (would need modification in ApplyFilter)

50 Dim allData(9) As snapshot 'all data within time period

```

55

```

Dim filterData(8) As snapshot 'a snapshot for each day in the view
Dim NDays As Integer 'number of days in display
Dim NSlots As Integer 'number of time slots in display
5 Dim NProgs As Integer 'number of programs in display
Dim colorField As String 'the database field that determines item color
                          '(the field should contain an integer)

Dim inPreview As Integer 'boolean 'if true, preview should show
Dim refDate 'reference date for data time slots
Dim slotsPerDay As Integer 'number of slots allowed per day
10 Dim currDay 'number of current day
Dim dayWidth As Integer 'width of day labels
Dim lblHeight As Integer 'height of day labels
Dim infoHeight As Integer 'height of specialized info panel
Dim timeHeight 'height of time labels
15 Dim startTime 'beginning time for view
Dim TSBegin As Long 'first time slot of current day
Dim TSEnd As Long 'last time slot of current day
Dim TScurrent As Long 'time slot of current program

Sub ApplyFilter ()
20 'filter for a particular show by title in userString
    Dim i As Integer 'counter

    'create snapshot for each day
    For i = 1 To NDays
25         allData(i).Filter = "Title = '" & userString & "'"
        Set filterData(i) = allData(i).CreateSnapshot()
        filterData(i).Sort = "StartTS"
        Set filterData(i) = filterData(i).CreateSnapshot()
    Next i
End Sub
30

Sub ChangeSel (d As String)
    'perform view navigation
    Dim current 'as database marker
    Dim success As Integer 'boolean
    Dim s As Integer 'station number
35 Dim best
    Dim TS As Long 'time slot
    Dim F As snapshot
    Dim aDay As Integer
    Dim marker 'as bookmark
40 Dim arrows As String

    'save values, initialize values
    current = filterData(currDay).Bookmark
    Set F = filterData(currDay)
    s = F("Station")
45 TS = TScurrent
    aDay = currDay
    success = False

    Select Case d
50 Case "Right"

```

55

```

'move to later time, same day
F.FindNext "StartTS > " & Str(TS)
success = Not F.NoMatch
5 If success Then
    'check if info arr ws needed
    TS = F("StartTS")
    F.MoveNext
    If Not F.EOF Then
        If F("StartTS") = TS Then
            infoArrows "down"
        Else
            infoArrows "none"
        End If
    Else
        infoArrows "none"
    End If
    F.MovePrevious
    End If
Case "Left"
'move to earlier time, same day
20 F.FindPrevious "StartTS < " & Str(TS)
success = Not F.NoMatch
If success Then
    TS = F("StartTS")
    'go to top of column
    F.FindFirst "StartTS = " & Str(TS)
    TS = F("StartTS")
    'check if info arrows needed
    F.MoveNext
    If Not F.EOF Then
        If F("StartTS") = TS Then
            infoArrows "down"
        Else
            infoArrows "none"
        End If
    Else
        infoArrows "none"
    End If
    F.MovePrevious
    End If
Case "Down"
'move to later day, trying to keep close to previous time slot
40 If NProgs < 1 Then Exit Sub 'do nothing if all snapshots empty
aDay = aDay + 1: TS = TS + 48
While Not success And aDay <= NDays
    Set F = filterData(aDay)
    F.FindFirst "StartTS > " & Str(TS)
    45 If F.NoMatch Then
        'no prog to right, look left for any programs
        If Not F.EOF Then F.MoveLast
        If Not F.EOF Then
            success = True
            TS = F("StartTS")
        End If
    End If

```

```

Else
    'save program to right, count time slots away, check left
    marker = F.Bookmark
    best = F("StartTS") - TS
5    F.FindLast "StartTS <= " & Str(TS)
    If F.NoMatch Then
        'no prog to left, take program to right
        F.Bookmark = marker
        TS = TS - best
10    Else
        'check distances from previous time slot
        If TS - F("StartTS") > best Then
            'right prog closest
            F.Bookmark = marker
            TS = TS - best
15    Else
        'left prog closest
        TS = F("StartTS")
        End If
    End If
    'either way, we found a program
    success = True
20    End If
    aDay = aDay + 1: TS = TS + 48
Wend
aDay = aDay - 1: TS = TS - 48
25    If success Then
        'make sure to be at the top of a column
        F.FindFirst "StartTS = " & Str(TS)
        If F.NoMatch Then Stop 'how did we get a TS with no program in it?
        TS = F("StartTS")
        'check if info arrows needed
30    F.MoveNext
        If Not F.EOF Then
            If F("StartTS") = TS Then
                infoArrows = "down"
            Else
                infoArrows = "none"
35    End If
        Else
            infoArrows = "none"
        End If
        F.MovePrevious
40    End If
Case "Up"
    'move to earlier day, trying to keep close to previous time slot
    If NProgs < 1 Then Exit Sub 'do nothing if all snapshots empty
    aDay = aDay - 1: TS = TS - 48
45    While Not success And aDay > 0
        Set F = filterData(aDay)
        F.FindFirst "StartTS > " & Str(TS)
        If F.NoMatch Then
            'no prog to right, look left
50    If Not F.EOF Then F.MoveLast

```

```

    If Not F.EOF Then
        success = True
        TS = F("StartTS")
    End If
5   Else
        'save program to right, count time slots away, look left
        marker = F.Bookmark
        best = F("StartTS") - TS
        F.FindLast "StartTS <= " & Str(TS)
10   If F.NoMatch Then
            'no prog to left, take program to right
            F.Bookmark = marker
            TS = TS - best
        Else
            'check distances
15   If TS - F("StartTS") > best Then
                'right prog closest
                F.Bookmark = marker
                TS = TS - best
            Else
                'left prog closest
20   TS = F("StartTS")
            End If
        End If
        'either way, we found a program
        success = True
25   End If
        aDay = aDay - 1: TS = TS - 48
    Wend
    aDay = aDay + 1: TS = TS + 48
    If success Then
30   'make sure to be at the top of a column.
        F.FindFirst "StartTS = " & Str(TS)
        If F.NoMatch Then Stop 'how did we get a TS with no program in it?
        TS = F("StartTS")
        'check if info arrows needed
        F.MoveNext
35   If Not F.EOF Then
            If F("StartTS") = TS Then
                infoArrows = "down"
            Else
                infoArrows = "none"
40   End If
        Else
            infoArrows = "none"
        End If
        F.MovePrevious
45   End If
    Case "Next"
        'find next program, same time and day
        F.MoveNext
        If Not F.EOF Then
            'success means still in same time slot
50   success = F("StartTS") = TS

```

55

```

End If
's t arrows
If success Then
    F.MoveNext
    arrows = "up"
    If Not F.EOF Then
        If F("StartTS") = TS Then arrows = "both"
    End If
    F.MovePrevious
    infoArrows arrows
End If
Case "Prior"
    'find previous program, same time and day
    F.MovePrevious
    If Not F.BOF Then
        'success means still in same time slot
        success = F("StartTS") = TS
    End If
    'set arrows
    If success Then
        F.MovePrevious
        arrows = "down"
        If Not F.BOF Then
            If F("StartTS") = TS Then arrows = "both"
        End If
        F.MoveNext
        infoArrows arrows
    End If
Case "none"
    'stay at current program, update the arrows (used at startup)
    If Not F.EOF Then
        F.MoveNext
        arrows = "none"
        If Not F.EOF Then
            If F("StartTS") = TS Then arrows = "down"
        End If
        F.MovePrevious
        infoArrows arrows
    End If
End Select

If success Then
    'update
    TSCurrent = F("StartTS")
    currDay = aDay
    DisplayProg
Else
    'restore database position
    filterData(currDay).Bookmark = current
End If
'set begin and end time slots for current day
TSBegin = DateDiff("n", refDate, (startTime - currDay - 1) * 30)
TSEnd = TSBegin + slotsPerDay - 1
End Sub

```



```

Sub DisplayProg ()
' set info box with current program info and highlight position
Dim F As snapshot
5   Dim msg As String

    Set F = filterData(currDay)
    msg = StationString(F("Station")) & " : " & Format(F("Start"), "h:mm AM/PM")
    msg = msg & " to " & Format(F("Finish"), "h:mm AM/PM. ")
10   msg = msg & Format(F("Title"))
    msg = msg & Chr(13) & "(episode info here)" & Format(F("Episode"))
    'note: current database does not contain episode information
    SetInfo msg, Color(F(colorField) Mod 9)

15   shpProg(0).Visible = False
    selector.Visible = False
    Position shpProg(0), F("StartTS"), F("FinishTS")
    CPlace 0, selector, shpProg(0)
    shpProg(0).Visible = True
    selector.Visible = True
20 End Sub

Sub DoPreview ()
' Construct an appropriate preview message and display
Dim msg As String

25   msg = filterData(currDay)("Title")
    msg = msg & Chr(13) & "on " & StationString(filterData(currDay)("Station")) &
Chr(13)
    msg = msg & CategoryString((filterData(currDay)("Type")),
' filterData(currDay)("Category"))
30   msg = msg & Chr(13) & DayString(Weekday(filterData(currDay)("Start")), "long")
    msg = msg & ", " & Format(filterData(currDay)("Start"), "mmm d, yy h:mm AM/PM")
    msg = msg & Chr(13) & " to " & Format(filterData(currDay)("Finish"), "h:mm
AM/PM")

35   popup.Caption = msg
    SizeAControl popup, (lblTime(1).top + 1.5 * lblTime(1).Height), 12,
(lblDay(1).Width), 45
    popup.Visible = True
    inPreview = True
End Sub

40 Sub DoSelect ()
' set data for selection and go to TV
    userStation = filterData(currDay)("Station")
    userStart = filterData(currDay)("Start")
    returnCode = TOTV
45   Me.Hide
End Sub

Sub DrawProg (duplicates As Integer, index As Integer)
' draw a program shape in display, marking it if there are duplicates at the
50 identical time slot

```

55

'shpProg(0) should be at the desired location

Dim above, below, side, wide  
Const GAP = .3

```

5      abov = shpProg(0).top
      below = shpProg(0).Height
      side = shpProg(0).Left
      wide = shpProg(0).Width
      ForeColor = blackCOLOR 'line color, thin black outline
10     FillStyle = 0 'solid
      drawwidth = 1

      Select Case duplicates
      Case 0
        'draw the program in the given color
15         fillColor = Color(index)
        Line (side, above)-(side + wide, above + below - .5 * GAP), , B
      Case 1
        'draw the program in grey and mark it
        fillColor = greyCOLOR 'indicate duplicates (which may be of different
20     colors)
        Line (side, above)-(side + wide, above + below - .5 * GAP), , B
        'draw icon
        above = above + GAP
        side = side - GAP
        wide = 2 * GAP
25         drawwidth = 2
        Line (side, above)-(side + wide, above + wide)
        Line (side, above - wide)-(side + wide, above)
        Line (side, above - .5 * wide)-(side + wide, above + .5 * wide)
        Line (side + .5 * wide, above)-(side + .5 * wide, above + wide)
30     Case Else
        'no need to redraw duplicate marks
      End Select

```

End Sub

```

35     Sub Form_Activate ()
        Dim i As Integer 'counter
        Static saveFilter As String

        If saveFilter = userString Then sameFilter = True
        saveFilter = userString
40         SetStatus "This Week: " & userString, greyCOLOR

        'if not same form, erase and redraw the week schedule
        If Not sameFilter Then
            Me.Cls
            SetInfo "Loading program information...", GREY
45             shpProg(0).Visible = False
            selector.Visible = False
            infoArrows "none"
            DoEvents
50
55

```

```

        ApplyFilter
        MakeDisplay
        sameFilter = True
5      End If
      End Sub

      Sub Form_KeyDown (KeyCode As Integer, Shift As Integer)
        Dim index As Integer
        Dim n As Integer
10       Select Case KeyCode
          Case Asc("Q")
            End
          Case B_BACK
            returnCode = BACK
            Me.Hide
15          Case B_HELP
            sameFilter = True
            InvokeHelp
          Case B_PREVIEW
            If inPreview Then
20              inPreview = False
              popup.Visible = False
            Else
              inPreview = True
            End If
          Case B_RIGHT
25          ChangeSel ("Right")
          Case B_LEFT
            ChangeSel ("Left")
          Case B_UP
            ChangeSel ("Up")
30          Case B_DOWN
            ChangeSel ("Down")
          Case B_SELECT
            If Not filterData(currDay).EOF Then DoSelect
          Case B_PAGEDOWN
35          ChangeSel ("Next")
          Case B_PAGEUP
            ChangeSel ("Prior")
          Case B_FILTER
            'go back to frmSelect to choose a new title
            returnCode = PICK
40          Me.Hide
          Case B_0
            returnCode = SHORTCUT
            Me.Hide
          End Select
45          If inPreview Then
            DoPreview
          Else
            popup.Visible = False
          End If
50      End Sub

```

55

```

Sub Form_Load ()
    Dim i As Integer

    's = form colors and fonts
    Me.BackColor = formCOLOR
    shpProg(0).BackColor = BorderColor
    lblDay(0).BackColor = backgroundCOLOR
    selector.BorderColor = BorderColor
    dayLine(0).BorderColor = divideCOLOR
    lblTime(0).ForeColor = slotCOLOR
    shpSlot(0).BorderColor = slotCOLOR
    infoPanel.FontSize = mediumFONT
    If displayMode = "TV" Then
        lblDay(0).FontSize = smallFONT
        lblTime(0).FontSize = smallFONT
        popup.FontSize = mediumFONT
    Else
        lblDay(0).FontSize = largeFONT
        lblTime(0).FontSize = largeFONT
        popup.FontSize = largeFONT
    End If
    'cover up the standard info box
    SizeAForm Me, 0, DispTop + DispHeight, DispLeft, dispWidth
    'set scale and size objects
    NDays = 7
    NSlots = 48
    dayWidth = 4
    lblHeight = 2
    infoHeight = 5
    If displayMode = "TV" Then
        upArrow.Left = 8950
        downArrow.Left = 8950
        timeHeight = 2
        downArrow.top = 650
        upArrow.top = 150
    Else
        timeHeight = 1.5
        downArrow.top = 1525
    End If
    Me.Scale (0, 0)-(NSlots * dayWidth, NDays * lblHeight + 2 * timeHeight +
infoHeight)
    selector.BorderWidth = 1
    'place extended info panel
    SizeAControl infoPanel, 0, infoHeight, 0, (Me.ScaleWidth)
    infoPanel.Caption = ""
    infoPanel.Visible = True
    'place day labels along side
    SizeAControl lblDay(0), lblHeight + infoHeight, lblHeight, 0, dayWidth
    For i = 1 To NDays
        Load lblDay(i)
        lblDay(i).Caption = DayString(i, "short")
        lblDay(i).top = (i - 1) * lblHeight + infoHeight + 2 * timeHeight
        lblDay(i).Visible = True
    Next i

```

```

'put AM/PM label across top
SizeAControl lblDay(0), infoHeight, timeHeight, dayWidth, NSlots
lblDay(0).Caption = "AM" NOON PM
5 lblDay(0).Visible = True
'put time labels across top
SizeAControl lblTime(0), (lblDay(0).Height) + infoHeight, timeHeight, 0, 2
For i = 1 To NSlots \ 2
    Load lblTime(i)
    10 lblTime(i).Caption = TimeLabel(DateAdd("h", (i - 1), fakeTODAY))
    lblTime(i).Left = 2 * i + 2
    lblTime(i).Visible = True
Next i
NProgs = 0
sameFilter = False
15 InputData
Form_Activate
End Sub

Sub infoArrows (direct As String)
'show or hide arrows in info box indicating presence of more programs at identical
20 time
Select Case direct
Case "up"
    downArrow.Visible = False
    upArrow.Visible = True
25 Case "down"
    upArrow.Visible = False
    downArrow.Visible = True
Case "both"
    upArrow.Visible = True
    downArrow.Visible = True
30 Case "none"
    upArrow.Visible = False
    downArrow.Visible = False
End Select
End Sub

35 Sub InputData ()
'part of form_load
'opens the database and creates allData snapshots

Dim DB As database
40 Dim RefSnap As snapshot
Dim i As Integer

Set DB = OpenDatabase(TVDB)

'get reference date and number of stations
45 Set RefSnap = DB.CreateSnapshot("Reference")
RefSnap.FindFirst "Name = 'Date'"
refDate = DateValue(RefSnap("Data"))
RefSnap.FindFirst "Name = 'NStations'"

50 Set allData(0) = DB.CreateSnapshot("Programs")

```

55

```

    startTime = r fDate
    TSBegin = 0
5    TSEnd = TSBegin + 48 - 1
    For i = 1 To 7
        allData(0).Filter = Overlap(TSBegin + 48 * (i - 1), TSEnd - 48 * (i - 1))
        Set allData(i) = allData(0).CreateSnapshot()
    Next i
    Set allData(0) = Nothing 'no longer need data all together
10 End Sub

Sub MakeDisplay ()
    'create schedule display on screen
    Dim i As Integer 'counter
    Dim d As Integer 'day
15 Dim TSlast As Integer 'last time slot affected
    Dim F As Snapshot 'convenience
    Dim offset As Integer 'used twice: dayline offset & number of programs sharing a
    time slot

20    'draw horizontal day lines
    drawwidth = 2
    ForeColor = lblDay(0).BackColor
    offset = infoHeight + 2 * timeHeight
    For i = 0 To NDays
25        Line (0, offset + i * lblHeight)-(52, offset + i * lblHeight)
    Next i

    'place program shapes
    offset = 0 'keep track of how full a particular time slot is
    colorField = "Category" 'note: should this be "Type" instead?
30    For d = 1 To NDays
        currDay = d
        TSlast = -1
        Set F = filterData(d)
        If Not F.EOF Then
35            F.MoveFirst
            Do While Not F.EOF
                If F("StartTS") = TSlast Then
                    offset = offset + 1
                    DrawProg offset, -1
                Else
40                    offset = 0
                    Position shpProg(0), F("StartTS"), F("FinishTS")
                    DrawProg offset, F(colorField) Mod 9
                    TSlast = F("StartTS")
                End If
                F.MoveNext
45            Loop
            F.MoveFirst
        End If
    Next d

50    'initialize stuff

```

55

```

    d = 1
    currDay = 1
    While d <= NDays
        If filterData(d).EOF Then
5           d = d + 1
        Else
            NProgs = 1 'just to make sure it is more than 0
            currDay = d
            d = NDays + 1
10          End If
        Wend
        shpProg(0).ZOrder
        selector.ZOrder
        If Not filterData(currDay).EOF Then
15           TScurrent = filterData(currDay)("StartTS")
            DisplayProg
            ChangeSel "none"
        End If
    End Sub

20 Sub Position (shape As Control, start, finish)
    'position a program shape
    Dim leftTS
    Dim rightTS
    Const smallGAP = .1

25    'convert to time slot scale
    leftTS = start - 48 * (currDay - 1)
    rightTS = finish - 48 * (currDay - 1)
    'set left and width
    shape.Left = dayWidth - leftTS
30    shape.Width = rightTS - leftTS + 1 - smallGAP
    'cut off at beginning of day
    If shape.Left < dayWidth Then
        shape.Width = shape.Width - (dayWidth - shape.Left)
        shape.Left = dayWidth
35    End If
    'set top and height
    shape.Height = 2 - 2 * smallGAP
    shape.Top = lblDay(currDay).Top + smallGAP
End Sub

40 Sub SetInfo (msg As String, Color)
    'override the global SetInfo to write to my own info panel
    infoPanel.BackColor = Color
    infoPanel.Caption = msg
End Sub

45 '===== WKDAY form code =====
Option Explicit
'schedule of 5 weekdays at a particular time
'uses time-slot guided navigation

50 Dim allData(8) As snapshot 'all data within time period

```

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```

Dim filterData(8) As snapshot 'a snapshot for each day in the view
Dim NDays As Integer 'number of days in display
Dim NSlots As Integer 'number of time slots in display
5 Dim NProgs As Integer 'number of programs in display
Dim NStation As Integer 'number of stations in display
Dim MaxStation As Integer 'total number of stations in database
Dim colorField As String 'the database field that determines item color
                          '(the field should contain an integer)
Dim inPreview As Integer 'boolean 'true if preview should show
10 Const sideGap = .05 'space at beginning and end of program
Const topGAP = 4 'space btwn time label and first program shape
Dim refDate 'reference date for data time slots
Const lblHEIGHT = 40 'height of day and time labels (in 500 scale)
Const MINProgWidth = .2 'minimum width of a program shape as fraction of slot
15 Dim slotsPerDay As Integer 'number of slots allowed per day
Dim currDay As Integer 'number of current day

Dim startTime 'start day and time of display
Dim TSBegin As Long 'first time slot
20 Dim TSEnd As Long 'last time slot
Dim TScurrent As Long 'current time slot
Dim rowOffset 'distance between (tops of) rows in the schedule

Sub ApplyFilter ()
'create data set of onpy TV programs that fit into query string filters(TV)
25 'set number of stations and database field determining color
Dim i As Integer 'counter

If InStr(filters(TV), "Station") Then
    NStation = 10
    'note: need better mechanism for displaying favorite channels
30 colorField = "Type"
Else
    NStation = MaxStation
    colorField = "Category"
End If
35 For i = 1 To NDays
    allData(i).Filter = filters(TV)
    Set filterData(i) = allData(i).CreateSnapshot()
Next i
End Sub

40 Sub ChangeSel (d As String)
Dim current, firstMatch 'as database markers
Dim success As Integer 'boolean
Dim s As Integer 'station
Dim TS As Long 'time slot
45 Dim F As snapshot
Dim aDay As Integer
Dim best As Integer

current = filterData(currDay).Bookmark
Set F = filterData(currDay)
50 s = F("Station")

```

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```

TS = TScurrent
aDay = currDay
succ ss = False

5   If d = "Right" Then
    'check to immediate right, same time slot
    F.MoveNext
    If Not F.EOF Then
        success = F("Station") = s And F("StartTS") = TS
10    End If
    If Not success Then
        'check time slots to right
        shpSlot(TS - TSBEGIN - 1 - (currDay - 1) * slotsPerDay).FillStyle =
15    'transparent
        lblTime(TS - TSBEGIN - 1 - (currDay - 1) * slotsPerDay).BackStyle =
        'transparent
        While aDay <= NDays And Not success
            While TS < TSEnd And Not success
                TS = TS + 1
                'check stations at and below current
20            F.FindFirst Overlap(TS, TS) & "And Station >= " & s
                If F.NoMatch Then
                    'take the last station above current
                    F.FindLast Overlap(TS, TS) & "And Station < " & s
                    success = Not F.NoMatch
                Else
                    'save this match and check if stations above are closer
                    success = True
                    best = F("Station") - s
                    firstMatch = F.Bookmark
                    'check previous
30            F.FindPrevious Overlap(TS, TS)
                    If F.NoMatch Then
                        'no previous match, stick with first match
                        F.Bookmark = firstMatch
                    Else
                        If s - F("Station") > best Then
                            'first match was closer
                            F.Bookmark = firstMatch
                        End If
                    End If
                End If
            Wend
40            If Not success Then
                TSBEGIN = TSBEGIN - 48
                TSEnd = TSBEGIN + slotsPerDay - 1
                TS = TSBEGIN - 1
                aDay = aDay + 1
45            Set F = filterData(aDay)
            End If
        Wend
    End If
ElseIf d = "Left" Then
50    'check to immediate left, same time slot

```

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```

F.MovePrevious
If Not F.BOF Then
    success = F("Station") = s And F("FinishTS") = TS
5   End If
    If Not success Then
        'check previous time slots
        shpSlot(TS - TSBEGIN + 1 + (currDay - 1) * slotsPerDay).FillStyle =
        transparent
        lbtTime(TS - TSBEGIN + 1 + (currDay - 1) * slotsPerDay).BackStyle =
10   transparent
        While aDay >= 1 And Not success      'for each day to left
            While TS > TSBEGIN And Not success 'look for previous slot this day
                TS = TS - 1
                F.FindFirst Overlap(TS, TS) & " And Station >= " & Str(s)
                If F.NoMatch Then
15   'none with station less than current, look for first one down
                    F.FindLast Overlap(TS, TS)
                    success = Not F.NoMatch
                Else
                    success = True
20   'mark this one and check up
                    firstMatch = F.Bookmark
                    best = F("Station") - s
                    F.FindPrevious Overlap(TS, TS) 'will be less than current
                    station
25   If F.NoMatch Then
                        'none lower, keep first match
                        F.Bookmark = firstMatch
                    Else
                        If s - F("Station") > best Then
                            'first match was closer
30   F.Bookmark = firstMatch
                        End If
                    End If
                End If
            Wend
        If Not success Then      'try previous day
35   aDay = aDay - 1
            TSBEGIN = TSBEGIN - 48
            TSEnd = TSBEGIN + slotsPerDay - 1
            TS = TSEnd + 1
            Set F = filterData(aDay)
40   End If
        Wend
    End If
    ElseIf d = "Down" Then
        'move down within time slot
45   'note: should we have option to only stop at programs that _begin_ in current
        time slot?
        'with exception of first time slot in each day, of course)
        F.Bookmark = current
        F.FindNext "(" & Overlap(TS, TS) & " And Station <> " & Str(s) & ")"
        success = Not F.NoMatch
50   ElseIf d = "Up" Then

```

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```

' move down within time slot
' note: should we have option to only stop at programs that _begin_ in current
' time slot?
5      (with exception of first time slot in each day, of course)
      F.Bookmark = current
      F.FindPrevious "(" & Overlap(TS, TS) & " And Station <> " & Str(s) & ")"
      success = Not F.NoMatch
      ElseIf d = "Top" Then
          F.FindFirst Overlap(TS, TS)
10      success = Not F.NoMatch
      ElseIf d = "Bottom" Then
          F.FindLast Overlap(TS, TS)
          success = Not F.NoMatch
      End If

15      If success Then
          ' update
          TScurrent = TS
          currDay = aDay
          DisplayProg
20      Else
          ' restore position in data
          filterData(currDay).Bookmark = current
      End If
      ' restore other stuff
25      TSBegin = DateDiff("n", refDate, (startTime + currDay - 1) \ 30
      TSEnd = TSBegin - slotsPerDay - 1
      shpSlot(TScurrent - TSBegin + 1 + (currDay - 1) * slotsPerDay).FillStyle =
      ' solid
      lblTime(TScurrent - TSBegin + 1 + (currDay - 1) * slotsPerDay).BackStyle =
      ' opaque
30      End Sub

Sub DisplayProg ()
    ' highlight location of current program
    ' put info for current program in info box
35      Dim F As snapshot
      Dim msg As String

      Set F = filterData(currDay)
      ' highlight program
      shpProg(0).Visible = False
40      selector.Visible = False
      Position shpProg(0), F("Start"), F("Finish"), F("Station")
      CPlace 0, selector, shpProg(0)
      shpProg(0).Visible = True
      selector.Visible = True

45      ' set message
      msg = StationString(F("Station")) & " - " & F("Title") & " - "
      msg = msg & Format(F("Start"), "h:mm AM/PM")
      msg = msg & " to " & Format(F("Finish"), "h:mm AM/PM")
      SetInfo msg, Color(F(colorField) Mod 9)
50      End Sub

```

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```

Sub DoPreview ()
'Construct an appropriate preview message and display
5   Dim msg As String

    msg = "Station: " & StationString(filterData(currDay)("Station"))
    msg = msg & Chr(13) & "Title: " & filterData(currDay)("Title") & Chr(13)
    msg = msg & CategoryString(filterData(currDay)("Type"))
    filterData(currDay)("Category"))
10   msg = msg & Chr(13) & "Time: " & Format(filterData(currDay)("Start"), "mmmm d,yy
      h:mm AM/PM")
    msg = msg & Chr(13) & " to " & Format(filterData(currDay)("Finish"), "mmmm
      AM/PM")

15   'show popup with preview message
    popup.Caption = msg
    popup.Top = lblTime(1).Top + 2 * lblTime(1).Height
    popup.Left = 2
    popup.Width = slotsPerDay * NDays - 3
    popup.Visible = True
20   inPreview = True
End Sub

Sub DoSelect ()
'set data for selection and go to TV
25   userStation = filterData(currDay)("Station")
    userStart = filterData(currDay)("Start")
    returnCode = TOTV
    Me.Hide
End Sub

30   Sub Form_Activate ()
    Dim i As Integer 'counter
    Static saveFilter As String

    If saveFilter = filters(currDomain) Then sameFilter = True
    saveFilter = filters(currDomain)
35   SetStatus "Evening TV: " & currFilter(TV), greyCOLOR
    'note: "Evening TV" label would be variable
    If inPreview Then
        popup.Visible = False
        inPreview = False
40   End If
    If newUser Then
        popup.Caption = "Press 'category' to change the kind of programs displayed."
        popup.Visible = True
        'note: ought to make popup go away on timer as well as button press
45   newUser = False
    End If

    If sameFilter Then
        'restore darkened time-slot
        If TScurrent > 0 Then
50
55

```

```

shpSlot(TScurrent - TSBEGIN - 1 + (currDay - 1) * slotsPerDay).FillStyle
= 1'solid
lblTime(TScurrent - TSBEGIN - 1 + (currDay - 1) * slotsPerDay).BackStyle
= 1'solid
5   End If
   Else
       'unload old program shapes and redo display
       SetInfo "Loading program information...", GREY
       shpProg(0).Visible = False
       10   lblDay(0).Visible = False
       lblTime(0).Visible = False
       shpSlot(0).Visible = False
       selector.Visible = False
       For i = 1 To NProgs
           15   Unload shpProg(i)
       Next i
       ApplyFilter
       MakeDisplay
       sameFilter = True
   End If
20 End Sub

Sub Form_KeyDown (KeyCode As Integer, Shift As Integer)
    'note: always turn off the black slot before leaving, so it doesn't mess up
    later views
    Dim Index As Integer
    25   Dim n As Integer
    Select Case KeyCode
        Case Asc("Q")
            End
        Case B_BACK
            30   shpSlot(TScurrent - TSBEGIN - 1 + (currDay - 1) * slotsPerDay).FillStyle =
            1'transparent
            lblTime(TScurrent - TSBEGIN - 1 + (currDay - 1) * slotsPerDay).BackStyle =
            0'transparent
            returnCode = BACK
            Me.Hide
            35   Case B_HELP
                sameFilter = True
                InvokeHelp
            Case B_PREVIEW
                If inPreview Then
                    40   popup.Visible = False
                    inPreview = False
                Else
                    inPreview = True
                End If
            Case B_RIGHT
                45   If Not filterData(currDay).EOF Then ChangeSel ("Right")
            Case B_LEFT
                If Not filterData(currDay).EOF Then ChangeSel ("Left")
            Case B_UP
                If Not filterData(currDay).EOF Then ChangeSel ("Up")
            50   Case B_DOWN

```

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```

        If Not filterData(currDay).EOF Then ChangeSel ("Down")
        Case B_SELECT
            shpSlot(TScurrent - TSBegin - 1 + (currDay - 1) * slotsPerDay).FillStyle =
1 'transparent
5         lblTime(TScurrent - TSBegin - 1 + (currDay - 1) * slotsPerDay).BackStyle =
        0'transparent
            If Not filterData(currDay).EOF Then DoSelect
            Case B_PAGEDOWN
                If Not filterData(currDay).EOF Then ChangeSel ("Bottom")
10         Case B_PAGEUP
                If Not filterData(currDay).EOF Then ChangeSel ("Top")
            Case B_FILTER
                shpSlot(TScurrent - TSBegin + 1 + (currDay - 1) * slotsPerDay).FillStyle =
1 'transparent
15         lblTime(TScurrent - TSBegin + 1 + (currDay - 1) * slotsPerDay).BackStyle =
        0'transparent
                returnCode = Filter
                Me.Hide
            Case B_0
                shpSlot(TScurrent - TSBegin - 1 + (currDay - 1) * slotsPerDay).FillStyle =
20         1'transparent
                lblTime(TScurrent - TSBegin - 1 + (currDay - 1) * slotsPerDay).BackStyle =
        0'transparent
                returnCode = SHORTCUT
                Me.Hide
25         End Select
            If inPreview Then
                DoPreview
            Else
                popup.Visible = False
            End If
30     End Sub

Sub Form_Load ()
    Dim d As Integer, i As Integer, n As Integer 'counters
    Dim t As Time
35     'set form colors and fonts
    Me.BackColor = formCOLOR
    shpProg(0).BackColor = BorderColor
    lblDay(0).BackColor = backgroundCOLOR
    selector.BorderColor = BorderColor
    dayLine(0).BorderColor = divideCOLOR
40     lblTime(0).ForeColor = slotCOLOR
    shpSlot(0).BorderColor = slotCOLOR
    If displayMode = "TV" Then
        lblDay(0).FontSize = smallFONT
        lblTime(0).FontSize = smallFONT
45     popup.FontSize = mediumFONT
    Else
        lblDay(0).FontSize = largeFONT
        lblTime(0).FontSize = largeFONT
        popup.FontSize = largeFONT
    End If
50     'set scale and size objects

```

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```

SizeAForm M , DispTop, DispHeight, DispLeft, DispWidth
Me.Scale (0, 0)-(500, 500)
SizeAControl lblDay(0), 0, lblHEIGHT, 0, 500
SizeAControl lblTime(0), lblHEIGHT, lblHEIGHT, 0, 50
5 SizeAControl shpSlot(0), 2 * lblHEIGHT - .5 * topGAP, 500 - 2 * lblHEIGHT, 0, 50
SizeAControl popup, 250, 200, 250, 200
selector.BorderWidth = 1
dayLine(0).Y1 = 0
dayLine(0).Y2 = 500
10 'init variables
sameFilter = False
sameView = False
inPreview = False
NProcs = 0
NDays = 5 'five week days
15 slotsPerDay = 6 'three hours, 6 half-hour slots
NSlots = NDays * slotsPerDay
startTime = fakeToday + CDate("7:00 PM") 'time would be variable and set at
activate
    startTime = DateAdd("d", 2 - Weekday(startTime), startTime) 'set startTime to
20 Monday(=2)
'set time slot scale and place the permanent objects
Me.ScaleWidth = NSlots
lblTime(0).Width = 1
shpSlot(0).Width = 1
For i = 1 To NDays
25 'place and caption day labels
Load lblDay(i)
SizeAControl lblDay(i), 0, lblHEIGHT, slotsPerDay * (i - 1), slotsPerDay
lblDay(i).Caption = DayString(i + 1, "short")
lblDay(i).Visible = True
Next i
30 For d = 1 To NDays
For i = 1 To slotsPerDay
n = (d - 1) * slotsPerDay + i
'place time slot dividers
35 Load shpSlot(n)
shpSlot(n).Move n - 1
shpSlot(n).ZOrder
shpSlot(n).Visible = True
'place time labels
Load lblTime(n)
40 lblTime(n).Move n - 1
lblTime(n).ZOrder
t = DateAdd("n", 30 * (i - 1), startTime)
lblTime(n).Caption = TimeLabel(t)
'time captions would be set at activate since they could change (when
sameView false)
45 shpSlot(i).FillStyle = 1'transparent
lblTime(i).BackStyle = 0'transparent
lblTime(n).Visible = True
Next i
'place day separators, but don't show yet
50 If d < NDays Then

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        Load dayLine(d)
        dayLine(d).X1 = d * slotsPerDay
        dayLine(d).X2 = d * slotsPerDay
5      End If
    Next d
    InputData
    Form_Activate
    sameView = True
10 End Sub

Sub InputData ()
    'part of form_load
    'opens the database and creates allData snapshots

15    Dim DB As database
    Dim RefSnap As snapshot
    Dim i As Integer

    Set DB = OpenDatabase(TVDB)
    'assumes data already sorted by station, start

20    'get reference date and number of stations
    Set RefSnap = DB.CreateSnapshot("Reference")
    RefSnap.FindFirst "Name = 'Date'"
    refDate = DateValue(RefSnap("Date"))
    RefSnap.FindFirst "Name = 'NStations'"
25    MaxStation = Val(RefSnap("Data"))

    Set allData(0) = DB.CreateSnapshot("Programs")

    'create snapshots of all programs for each weekday at fixed time
    'time would be variable and these would have to be created at activate
30    TSBEGIN = DateDiff("n", refDate, startTime) \ 30
    TSEnd = TSBEGIN + slotsPerDay - 1
    For i = 1 To 5
        allData(i).Filter = Overlap(TSBEGIN + 48 * (i - 1), TSEnd - 48 * (i - 1))
35    '48 time slots/day
        Set allData(i) = allData(0).CreateSnapshot()
    Next i
    Set allData(0) = Nothing 'won't be needing everything since time is fixed
End Sub

40 Sub MakeDisplay ()
    'create the visual schedule of programs from the filtered data
    Dim d As Integer 'day
    Dim c As Integer 'counter
    Dim F As snapshot 'convenience
45    Dim hasProgs As Integer 'remember the first day that has programs in it

    'set times showing
    If Not sameView Then
        'would change time labels here
50    End If

```

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```

'place program shapes
hasProgs = 0
c = 0 'init count of shpProgs
5 On Error GoTo ErrorHandler 'if we run out of shpProgs to allocate
For d = 1 To NDays
    currDay = d
    Set F = filterData(d)
    'create a shape control for each TV program in the data
    If Not F.EOF Then
10         F.MoveFirst
        Do While Not F.EOF
            Load shpProg(c + 1)
            c = c + 1 'increment only after allocate succeeds
            shpProg(c).BackColor = Color(F(colorField) Mod 9)
            Position shpProg(c), F("Start"), F("Finish"), F("Station")
15            shpProg(c).ZOrder
            shpProg(c).Visible = True
            F.MoveNext
        Loop
        F.MoveFirst
20 If hasProgs = 0 Then hasProgs = d 'remember the first day with programs
In It
    End If
Next d
MoveOn:
25 On Error GoTo 0 'quit trapping errors internally
'make day lines visible on top
For d = 1 To NDays - 1
    dayLine(d).ZOrder
    dayLine(d).Visible = True
30 Next d

'initialize stuff
NProgs = c
currDay = hasProgs
shpProg(0).ZOrder
selector.ZOrder
35 If currDay > 0 Then
    'set time slot begin and end numbers for current day
    TSBegin = DateDiff("n", refDate, startTime) \ 30 + 48 * (currDay - 1)
    TSEnd = TSBegin + slotsPerDay - 1
    TScurrent = TSBegin
40 Set F = filterData(currDay)
    Do While TScurrent <= TSEnd
        F.FindFirst Overlap(TScurrent, TScurrent)
        If Not F.NoMatch Then
            DisplayProg
            Exit Do
45        End If
        TScurrent = TScurrent + 1
    Loop
Else
    TSBegin = DateDiff("n", refDate, startTime) \ 30
50 TSEnd = TSBegin + slotsPerDay - 1

```

```

        TScurrent = TSBEGIN
        currDay = 1
    End If
    shpSlot(TScurrent - TSBEGIN + 1 + (currDay - 1) * slotsPerDay).FillStyle =
5      0'solid
    lblTime(TScurrent - TSBEGIN + 1 + (currDay - 1) * slotsPerDay).BackStyle =
    1'opaque
    Exit Sub
10
ErrorHandler:
    If Err = 342 Then
        'ran out of room to allocate program shapes, quit drawing
        Resume MoveOn
    Else
15      Dim msg
        msg = Error & Chr(13) & "Resume or Cancel?"
        msg = InputBox(msg, "Error Correction", "Resume")
        If msg = "" Then Stop
        Resume MoveOn
    End If
20 End Sub

Sub Position (shape As Control, start, finish, station)
    'position a program shape for display
    Dim relativeL, relativeW, dayStart
25    Dim edge
    'convert a day/time to position in NSlot scale
    dayStart = startTime + currDay - 1
    relativeL = (start - dayStart) * 48
    relativeW = (finish - dayStart) * 48 - relativeL
    'clip shapes off at day boundaries
30    If relativeL < 0 Then
        relativeW = relativeW + relativeL
        relativeL = 0
    End If
    If relativeW + relativeL > slotsPerDay Then relativeW = slotsPerDay - relativeL
35    'set left and width of shape
    edge = (currDay - 1) * slotsPerDay
    shape.Left = relativeL + edge + sideGap
    shape.Width = relativeW - 2 * sideGap
    'enforce minimum width so program is visible
40    If shape.Width < MINProgWidth Then shape.Width = MINProgWidth
    'set top according to station
    'note: this scheme only works because stations are named 1..n
    rowOffset = ((500 - 2 * lblHEIGHT - shpProg(0).Height) / NSStation)
    shape.Top = shpSlot(0).Top + topGAP + (station - 1) * rowOffset
45 End Sub
50

```

Thus, it will now be understood that there has been disclosed a method and apparatus of finding and selecting a program to view from a large schedule of TV programs. While the invention has been particularly illustrated and described with reference to preferred embodiments thereof, it will be understood by those skilled in the art that various changes in form, details, and applications may be made therein. For example, color coding of the individual items of the reduced representations and of the various entries in the various grid displays could be used to assist the viewer in making rapid program selections. Another example is that it is easily within the capabilities of this art to modify a TV set by integrating the set top box according to the present invention into it. It is accordingly intended that the appended

claims shall cover all such changes in form, details and applications which do not depart from the true spirit and scope of the invention.

## 5 Claims

1. Apparatus for selecting an item from a group thereof in a system having display means and interactive movable pointing means for specifying a location in the display means and making a selection at a specified location, the apparatus comprising:

filtration means including subgroup specifiers in the display means and responsive to selection of a subgroup specifier by the pointing means for filtering the group to produce the subgroup specified by the selected subgroup specifier;

means for displaying representations of group items belonging to at least a portion of the subgroup in the display means; and

group item selection means for selecting a group item by selecting the representation thereof in the display in response to the pointing means.

2. The apparatus set forth in claim 1 wherein:

the pointing means need only be movable from one representation to an adjacent representation.

3. The apparatus set forth in claim 1 wherein:

the means for displaying the representations comprises:

first means for displaying the representations in a single dimension; and

second means for displaying the representations in two dimensions.

4. The apparatus set forth in claim 1 further comprising:

means for displaying a reduced representation of the entire subgroup and an indication in the reduced representation of the portion of the group being presently displayed by the display means.

5. The apparatus set forth in claim 4 wherein said reduced representation is two dimensional.

6. The apparatus set forth in claim 5, wherein said interactive movable pointing means includes a remote control having:

a first pair of buttons to control changes in location in the display in a first direction; and

a second pair of buttons to control changes in location in the display in a second direction.

7. The apparatus set forth in claim 4 wherein said reduced representation is a two dimensional representation of a three dimensional representation, the third dimension being location within a logical stack of items having at least one common property.

8. The apparatus set forth in claim 7 wherein each item of a logical stack have viewing timeslot as one common property.

9. A method comprising the steps of:

receiving program schedule data by a set top box via a same information conductor that conducts program information to the set top box;

filtering said program schedule data in RAM within said set top box;

said set top box showing a first interactive display on a TV connected thereto presenting a plurality of choices for filtering said program schedule data to a viewer;

in response to an interactive selection by said viewer, filtering said program schedule data into a first subgroup of program schedule data;

also in response to an interactive selection by said viewer, said set top box showing a second interactive display on said TV having a second plurality of choices for filtering said program schedule data;

in response to a second interactive selection by said viewer, filtering said first subgroup into a second subgroup;

and

also in response to a second interactive selection by said viewer, said set top box showing a third interactive display on said TV having a representation of each program item of said second subgroup.

10. The method of claim 9, wherein said receiving program schedule data step further comprises the steps of

receiving a first portion of said program schedule data via said set top box; and  
receiving a second portion of said program schedule data at a later non-contiguous time.

11. The method of claim 9, further comprising the step of:

in response to an interactive highlighting of a representation of a program item of said second subgroup,  
displaying a title thereof.

12. The method of claim 11, further comprising the step of:

in response to an actuation of a select button of a remote control, displaying a preview of said highlighted  
program.

13. The method of claim 12, further comprising the step of:

in response to a second actuation of said select button of said remote control, switching said set top box to  
display a TV program corresponding to said highlighted representation.

14. The method of claim 12, further comprising the step of:

in response to a second actuation of said select button of said remote control, storing a command to switch  
said set top box to display a TV program corresponding to said highlighted representation in when that TV program  
begins.

15. A method comprising the steps of:

receiving program schedule data for at least 300 individual channels for a time period of at least a week;  
storing said program schedule data in local memory for rapid sorting and retrieval in a database format;  
filtering the program schedule data in response to interactive user inputs into a subgroup of the program  
schedule data;  
displaying the subgroup of the program schedule data for the user's review; and  
interactively selecting a program from the subgroup of program schedule data for viewing on a TV screen.

16. A method for choosing a desired program from a large schedule of programs whose data is stored in a local  
memory, comprising the steps of:

displaying a vertically cascaded group of cards with each card representing a program of a particular time and  
channel;  
displaying a selection window located around a subgroup of said group of cards;  
displaying a two-dimensional grid adjacent to said vertically cascaded group of cards in which said subgroup  
of the programs represented by said vertically cascaded group of cards are shown in greater detail;  
displaying a first active area within said selection window highlighting one of said subgroup of programs;  
displaying a second active area within said two-dimensional grid, said second active area being located around  
and highlighting greater details of the program highlighted in said first active area;  
moving said first active area in a vertical direction in response to vertical direction arrows to a viewer's input  
of a remote control; and  
selecting a desired program by moving said active area to said desired program and actuating a select button  
until said set top box makes said selection.

17. The method according to claim 16, further comprising the steps of

after said active area is moved one location outside of said selection window by inputs from said viewer,  
moving said selection window to a contiguous subgroup to which said active area has moved.

18. Apparatus for selecting an item from a group thereof in a system having display means and interactive movable  
pointing means for specifying a location in the display means and making a selection at a specified location, the  
apparatus comprising:

filtration means including subgroup specifiers in the display means and responsive to selection of a subgroup specifier by the pointing means for filtering the group to produce the subgroup specified by the selected subgroup specifier;

means for displaying representations of group items belonging to the subgroup in the display means;

group item selection means for selecting a group item by selecting the representation thereof in the display in response to the pointing means; and

means for displaying a reduced representation of the entire subgroup and an indication in the reduced representation of the portion of the group being presently displayed by the display means;

said reduced representation displaying means displaying a two dimensional representation of a three dimensional representation, a third dimension being represented as a logical stack of items having at least one common property.

19. The apparatus set forth in claim 8 or 18, wherein said interactive movable pointing means includes a remote control having:

a first pair of buttons to control changes in location in the display in a first direction; and

a second pair of buttons to control changes in location in the display in a second direction; and

a third pair of buttons to control changes in location within the logical stack.

FIG. 1

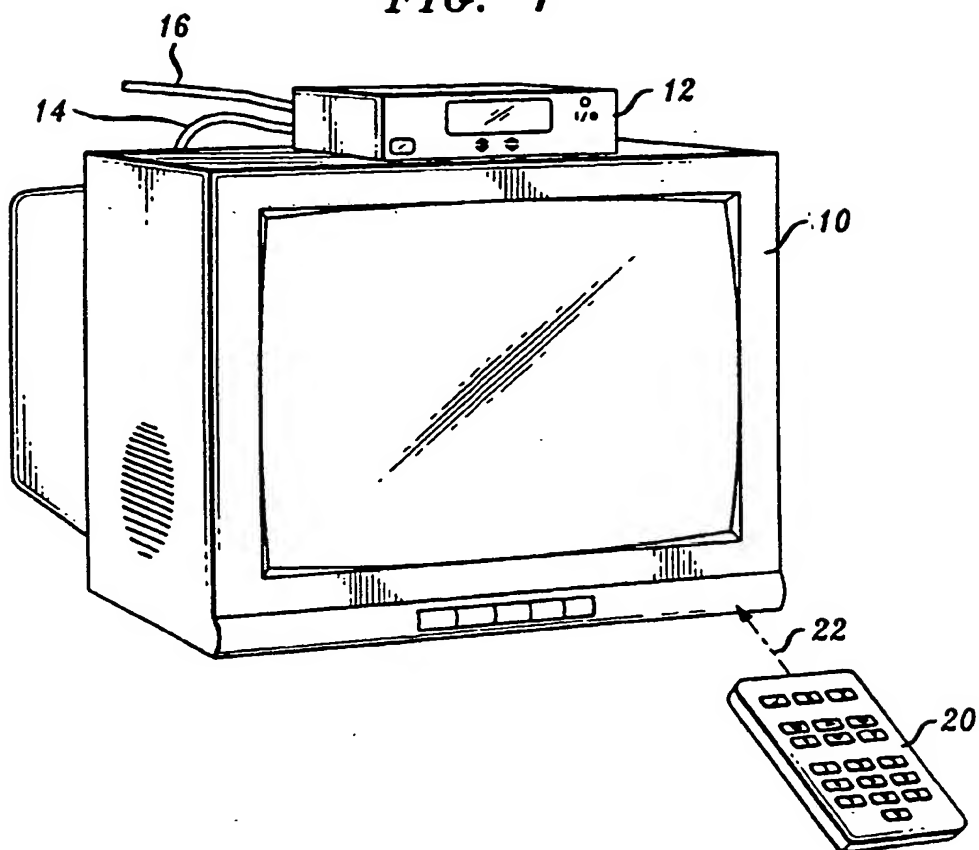


FIG. 2

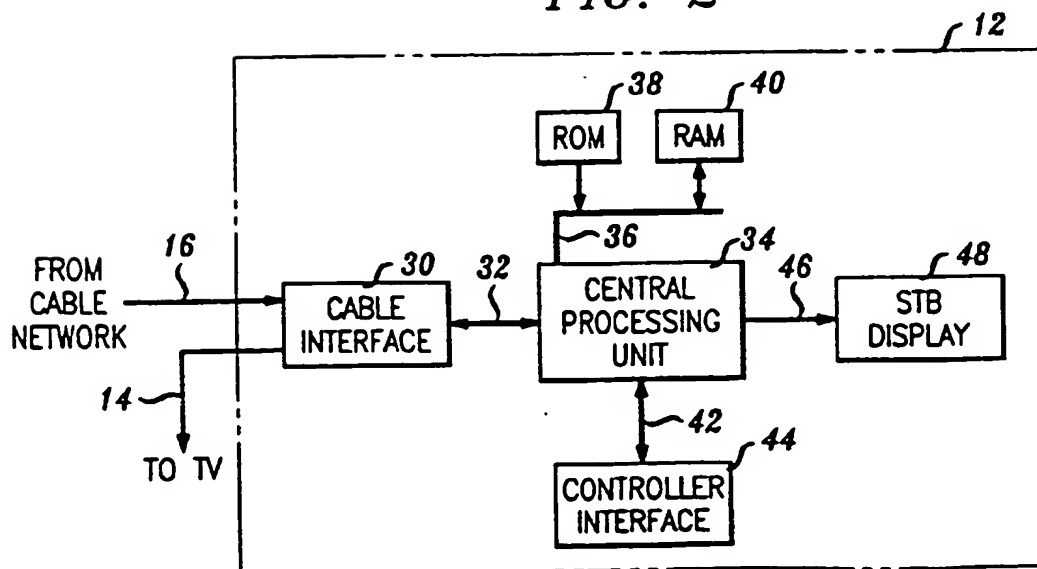


FIG. 3

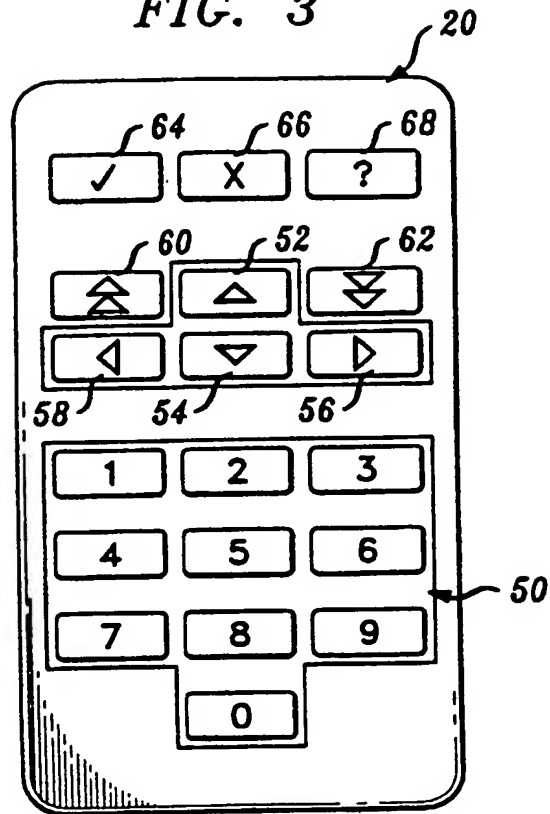


FIG. 4

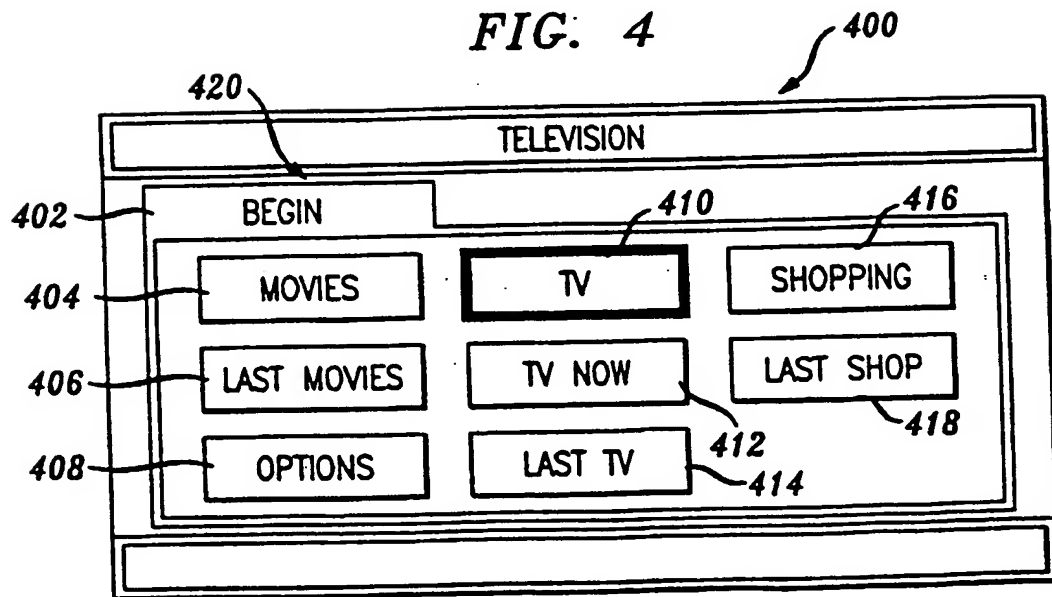


FIG. 5

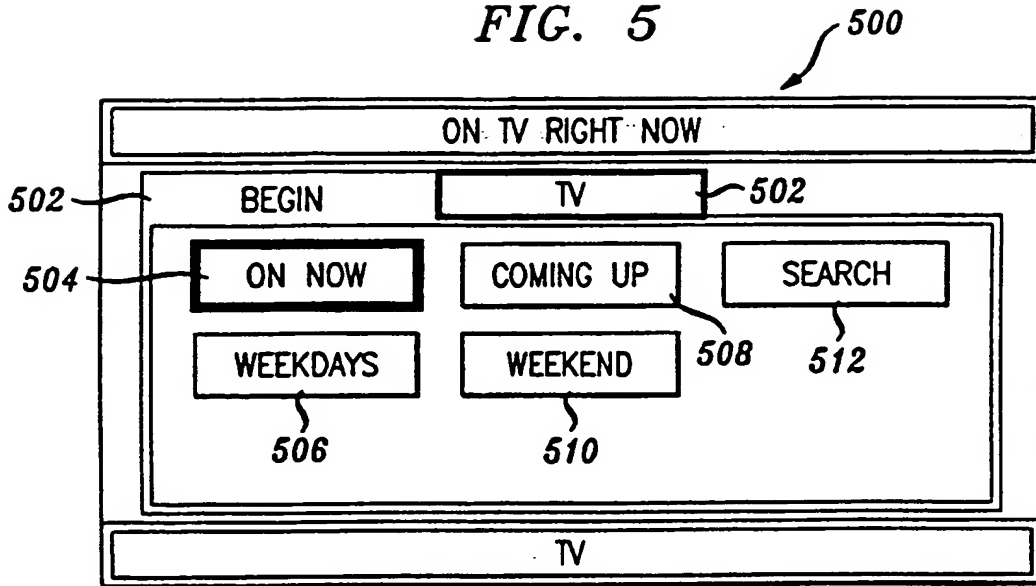


FIG. 6

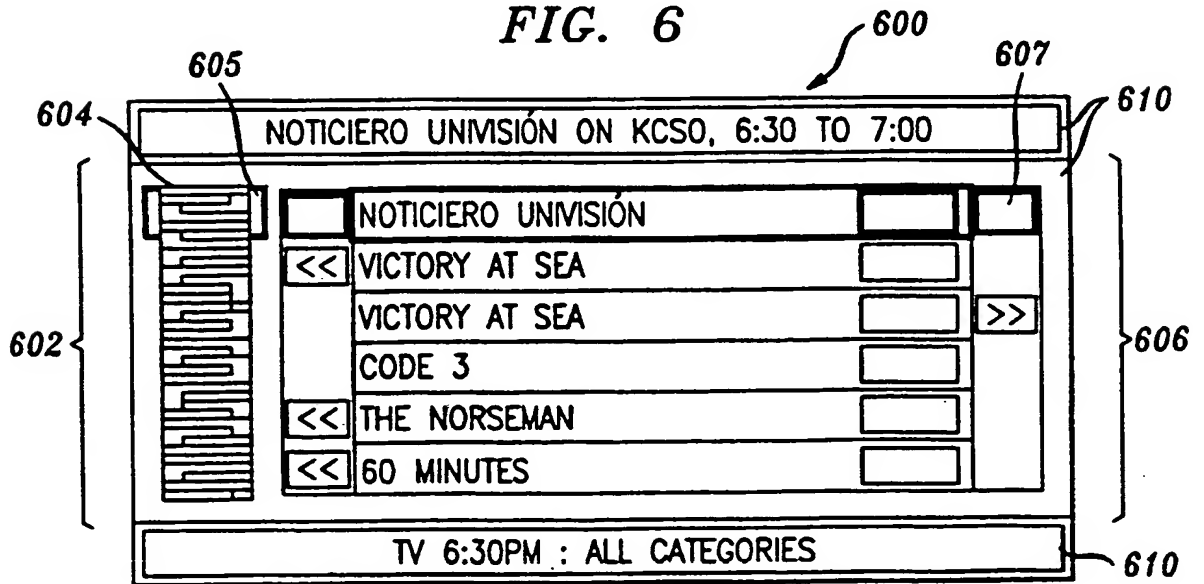




FIG. 7

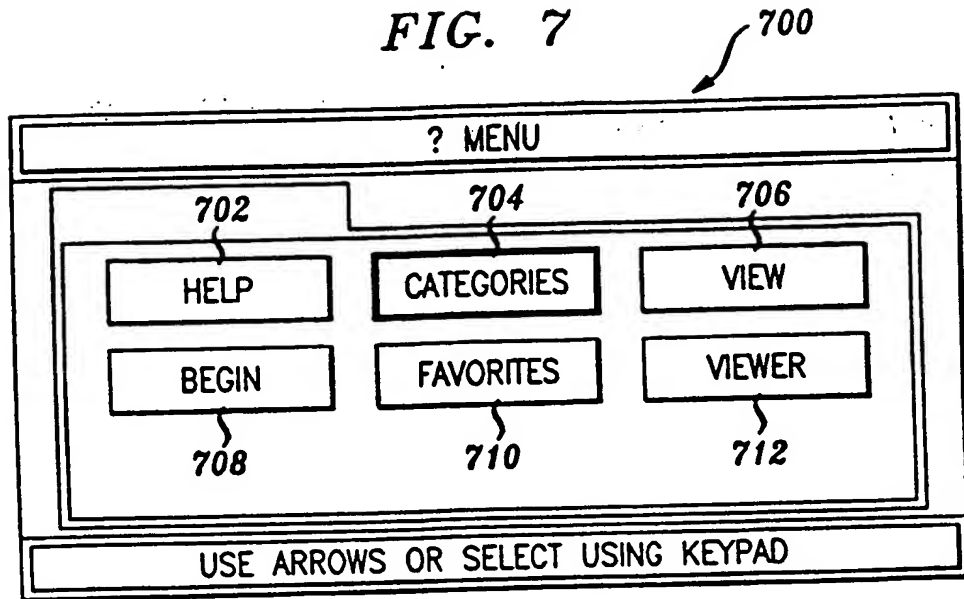


FIG. 8

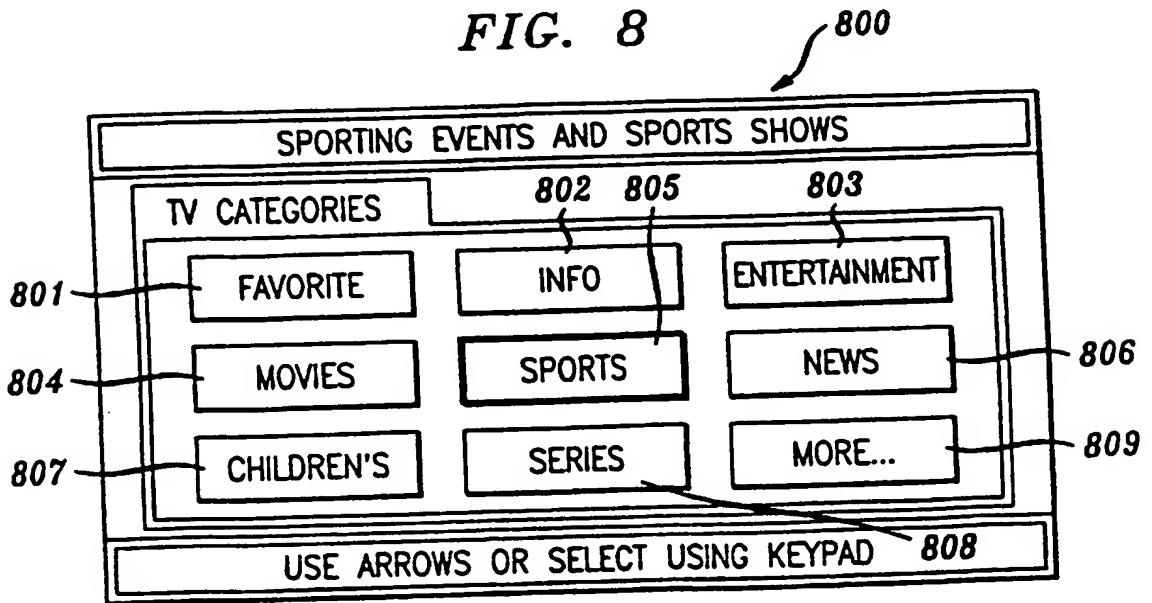


FIG. 9

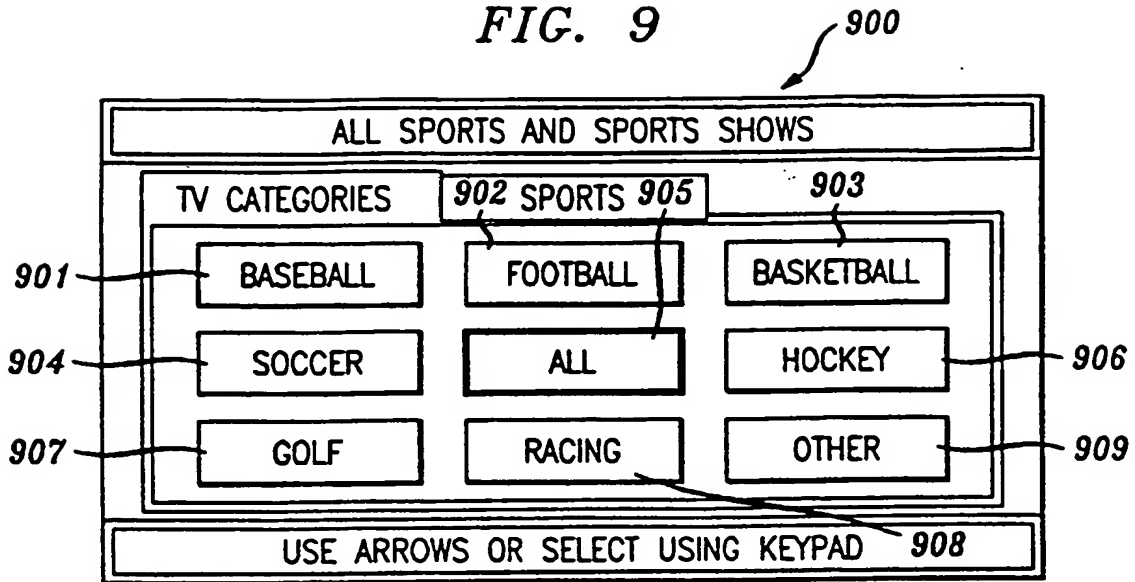


FIG. 10

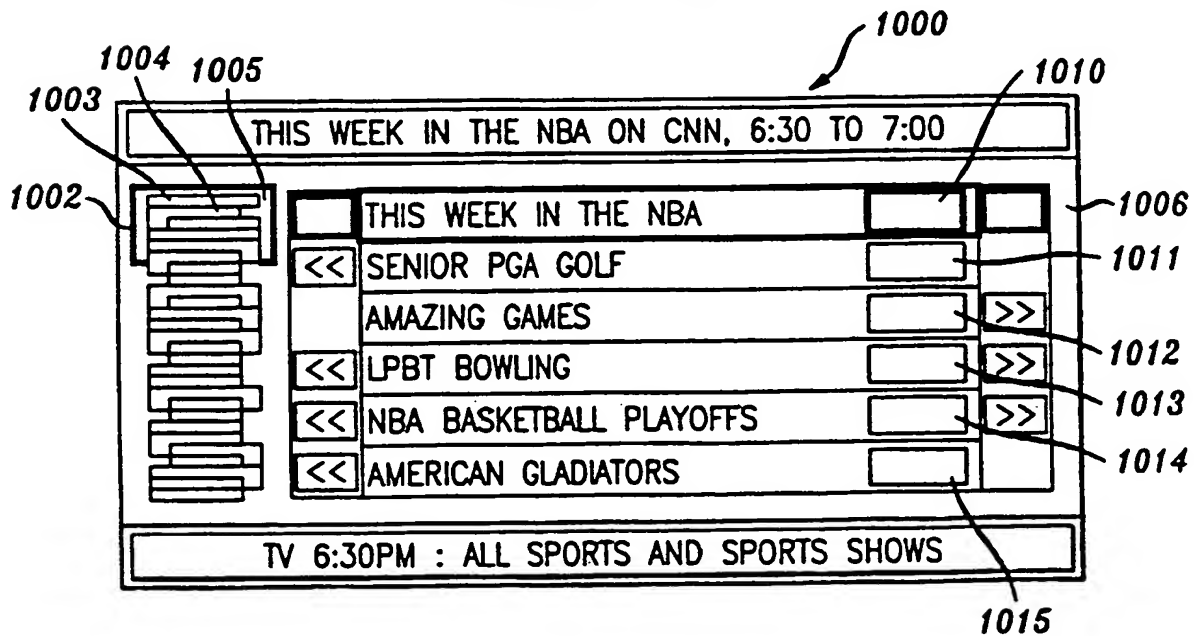


FIG. 11

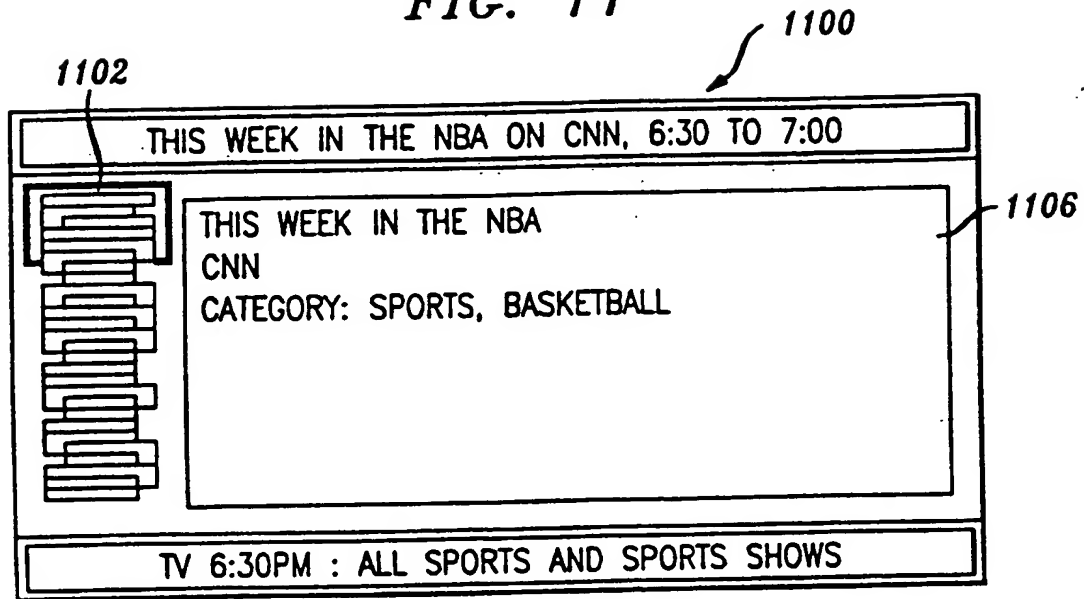


FIG. 12

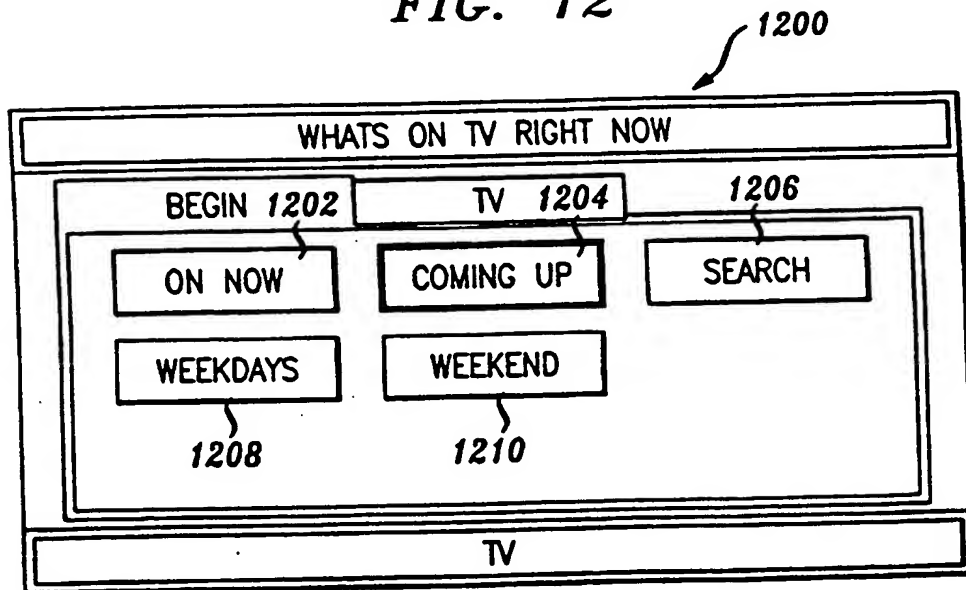


FIG. 13

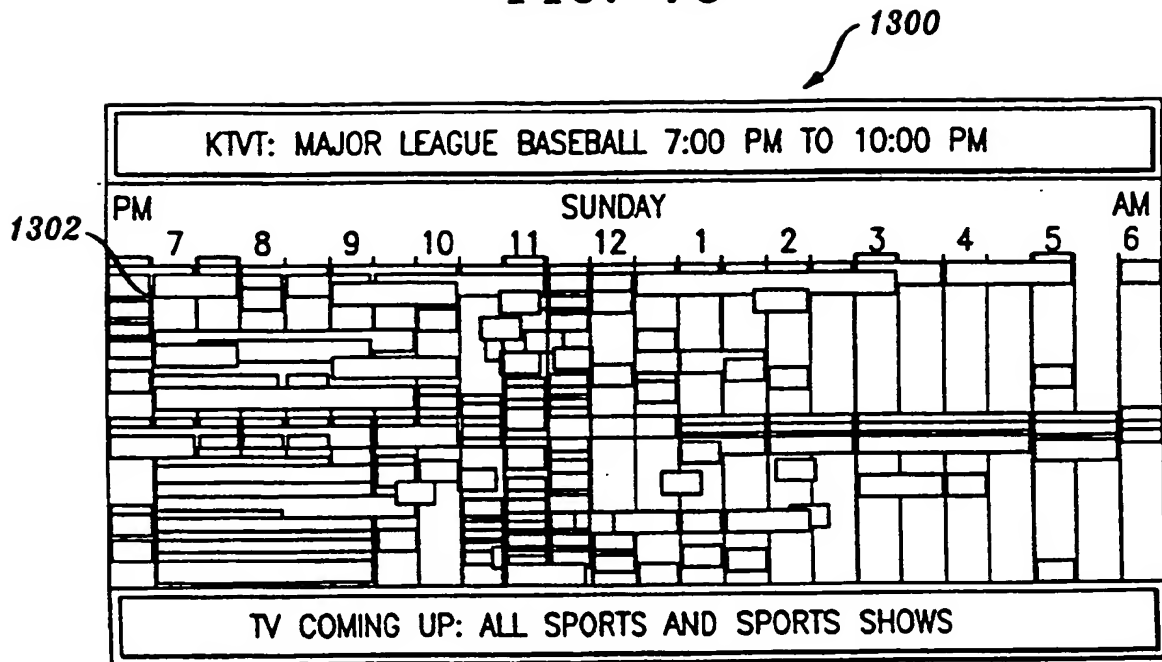


FIG. 14

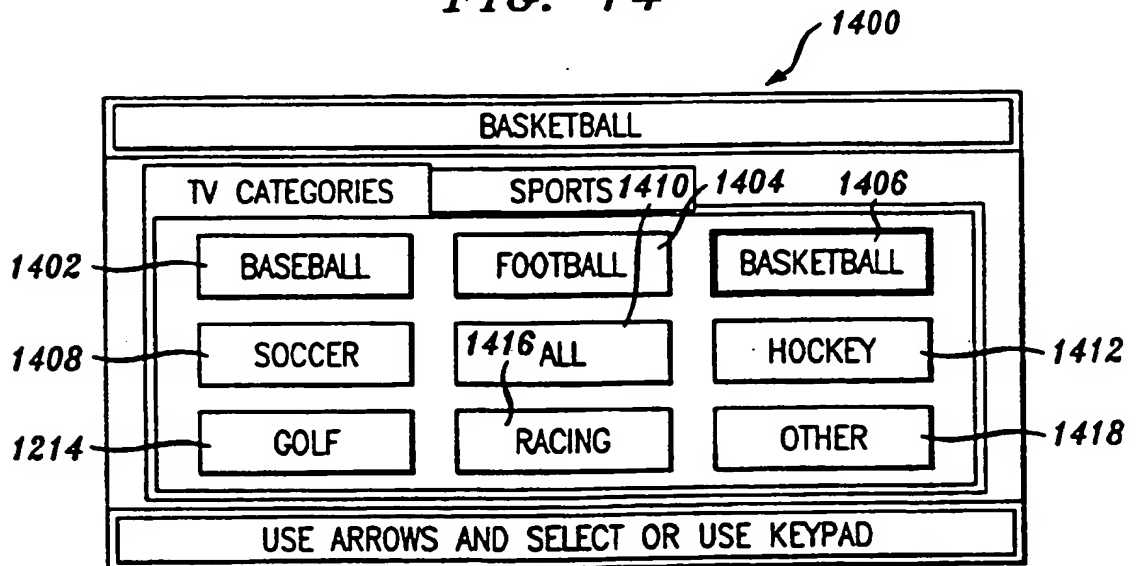


FIG. 15

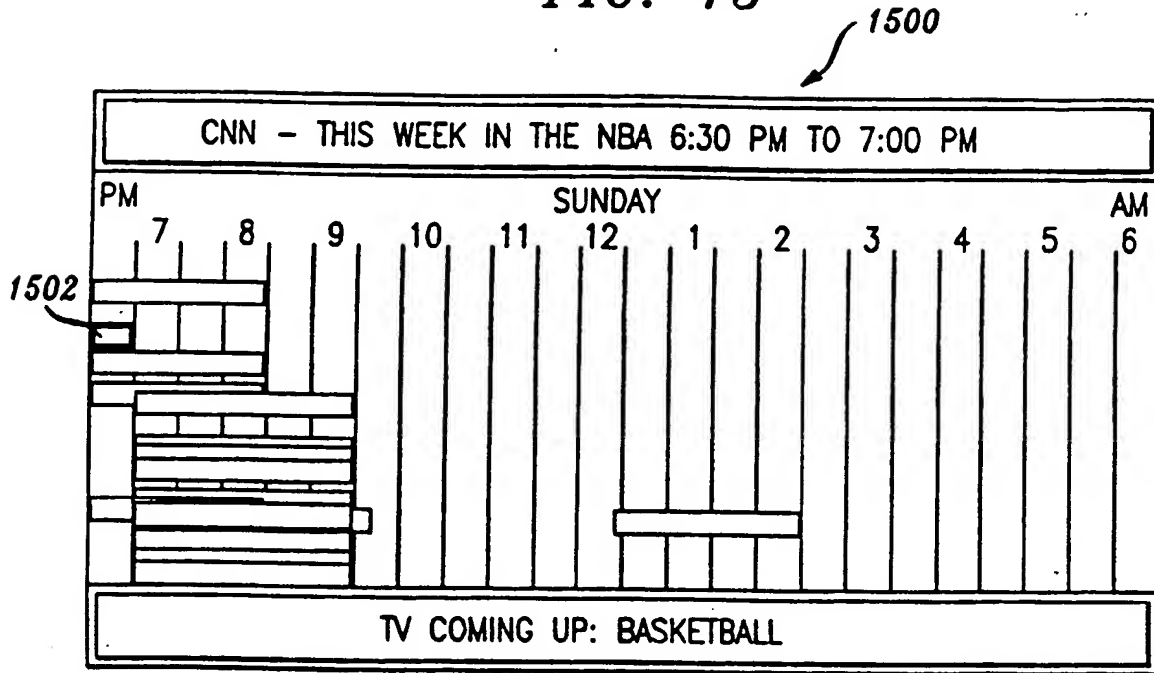


FIG. 16

1600

TITLES BEGINNING WITH 'SYMBOL OR NUMBER'	
<input type="checkbox"/>	SYMBOL OR NUMBER >>
<input type="checkbox"/>	A, B, C, D, E, F, >>
<input type="checkbox"/>	G, H, I, J, K, L, >>
<input type="checkbox"/>	M, N, O, P, Q, R, >>
<input type="checkbox"/>	S, T, U, V, W, X, >>
<input type="checkbox"/>	Y, Z >>

TV. SEARCH

*FIG. 17* 1700

TITLES BEGINNING WITH 'M, N, O, P, Q, R'	
<input type="checkbox"/>	SYMBOL OR NUMBER >>
<input type="checkbox"/>	A, B, C, D, E, F, >>
<input type="checkbox"/>	G, H, I, J, K, L, >>
<input checked="" type="checkbox"/>	M, N, O, P, Q, R, >>
<input type="checkbox"/>	S, T, U, V, W, X, >>
<input type="checkbox"/>	Y, Z >>
TV. SEARCH	

*FIG. 18* 1800

TITLES BEGINNING WITH 'M'	
<input checked="" type="checkbox"/>	M >>
<input type="checkbox"/>	N >>
<input type="checkbox"/>	O >>
<input type="checkbox"/>	P >>
<input type="checkbox"/>	Q >>
<input type="checkbox"/>	R >>
TV TITLES STARTING WITH M, N, O, P, Q, R	

*FIG. 19* 1900

TITLES BEGINNING WITH 'N'	
<input type="checkbox"/>	M >>
<input checked="" type="checkbox"/>	N >>
<input type="checkbox"/>	O >>
<input type="checkbox"/>	P >>
<input type="checkbox"/>	Q >>
<input type="checkbox"/>	R >>
TV TITLES STARTING WITH M, N, O, P, Q, R	

FIG. 20 2000

N.E. AUTO CLASSIFIED	
<input type="checkbox"/>	N.E. AUTO CLASSIFIEDS
	NLEC WORSHIP
	NNN NEWS MAGAZINE >>
	NO >>
	NYPD BLUES
TV TITLES STARTING WITH N	

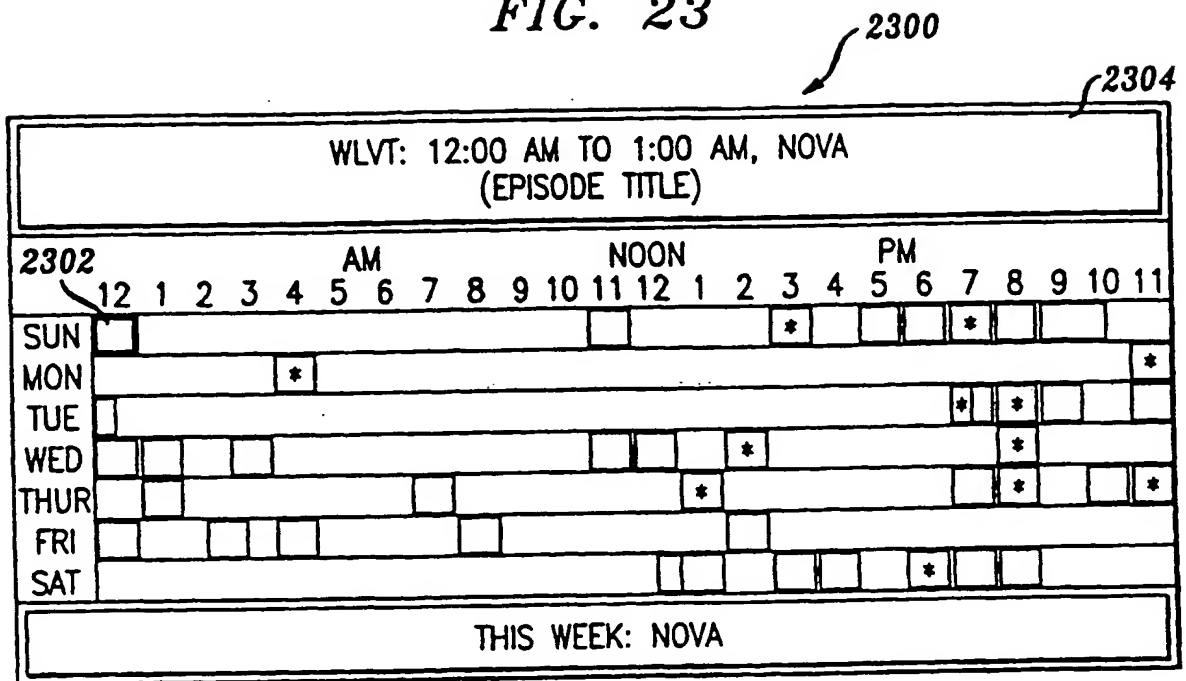
FIG. 21 2100

TITLES BEGINNING WITH 'NO'	
	N.E. AUTO CLASSIFIEDS
	NLEC WORSHIP
	NNN NEWS MAGAZINE >>
<input type="checkbox"/>	NO >>
	NYPD BLUES
TV TITLES STARTING WITH N	

FIG. 22 2200

NOVA	
<input type="checkbox"/>	NOVA >>
	NOW GENERATION >>
TV TITLES STARTING WITH NO	

FIG. 23





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(11)

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(12)

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(54) **Method and apparatus for finding and selecting a desired data item from a large schedule of data items using a TV set and a controller similar to a TV-remote-control**

(57) An apparatus and method for presenting a viewer with an overall representation of the present number of entertainment programs available for selection given one week of program schedule data for 300 or more channels and one or more filtering criteria to limit the number of items represented in the overall representation. Sequentially applied filters will filter the group of program schedule data items that has at least 100,000 half hour time slots offered by 300 channels each week into a smaller subgroup where individual

consideration of each item of the subgroup can be made in a reasonable time. A set top box drives the display of overall representations or results of filtering criteria on a commercial TV set. Once a reasonable sized subgroup is obtained, other displays provide specific information of the program offerings of the subgroup. Selection of the filtering criteria and selection from within a subgroup is interactively made by a viewer through the use of a controller that looks and operates very much like a TV remote control. This makes the interaction familiar, easy and predictable.

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European Patent  
Office

## EUROPEAN SEARCH REPORT

Application Number  
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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X A	EP 0 560 593 A (SONY) * column 3, line 35 - column 5, line 45 * * column 21, line 23 - column 22, line 18; figure 19 * ---	1-6,18 16,17	H04N5/445
X	BRUGLIERA V: "DIGITAL ON-SCREEN DISPLAY A NEW TECHNOLOGY FOR THE CONSUMER INTERFACE" 11 June 1993, CABLE TV SESSIONS, MONTREUX, JUNE 10 - 15, 1993, NR. SYMP. 18, PAGE(S) 571 - 586, POSTES;TELEPHONES ET TELEGRAPHES SUISSES XP000379382 * the whole document *	1-3,9, 11-15	
A	---	18	
X	WO 94 14282 A (DISCOVERY COMMUNICATIONS) * page 3, line 4 - line 19 * * page 4, line 8 - page 5, line 2 * * page 5, line 30 - page 7, line 22 * * page 12, line 7 - line 21 * * page 13, line 14 - line 32 * * page 14, line 12 - page 15, line 2 * * page 23, line 14 - page 24, line 28 * * page 26, line 17 - line 28 * * page 27, line 5 - line 31 * * page 29, line 31 - page 30, line 8 * * page 34, line 28 - page 35, line 5 * * page 51, line 10 - page 52, line 30 * * page 56, line 7 - page 57, line 22 * * page 72, line 15 - page 77, line 25 * * figures 9A,9B,13-19 * ---	1,2,9-15	TECHNICAL FIELDS SEARCHED (Int.Cl.6) H04N
A	WO 93 22877 A (ICTV) * page 33, line 4 - page 34, line 34 * * figures 8,33,36-41 * ---	1,2,9-15	
	--- -/-		
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 2 July 1997	Examiner Berwitz, P
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background : non-written disclosure P : intermediate document I : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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# EUROPEAN SEARCH REPORT

Application Number  
EP 96 30 1902

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
P,A	EP 0 645 927 A (THOMSON CONSUMER ELECTRONICS) * column 1, line 44 - line 48 * * column 3, line 5 - line 16 * * column 3, line 53 - column 4, line 10 * * column 5, line 18 - line 54 * * column 6, line 35 - column 7, line 1 * ---	1,9,11, 15	
P,A	WO 95 26608 A (LOEWE OPTA) * page 4, line 16 - page 6, line 21 * * page 7, line 4 - line 12 * * page 8, line 4 - page 10, line 27 * * page 11, line 15 - line 31 * * page 13, line 1 - line 12 * ---	1,2,9, 11-15	
E	EP 0 721 253 A (SONY) * column 1, line 8 - line 19 * * column 3, line 2 - line 15 * * column 19, line 17 - line 25 * * column 19, line 51 - column 20, line 13; figures 2,23-26 * -----	1,2,9, 11-13	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
Place of search THE HAGUE		Date of completion of the search 2 July 1997	Examiner Berwitz, P
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application I : document cited for other reasons ..... @ : member of the same patent family, corresponding document	

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